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SOUTH BETHLEHEM FILTRATION PLANT*

An Improved Slow Sand System—What It Is and What It Will Do—The Story Vividly Told by the Inventor

By P. A. Maignen

THE water supply of South Bethlehem is drawn from the river Lehigh. It is soft and usually free from any great number of bacteria. In times of freshets a considerable amount of fine culm floats in the water and makes it as black as ink. Some industrial establishments allow their refuse, mostly iron, to reach the river, and this makes the water at times quite red. But these impurities are in suspension and do not affect the chemical quality of the water, which is always good. The nature of the water-shed and the rapid flow of the river prevents the accumulation of organic mud in the bed of the river, and the water is at all times free from objectionable odor or taste.

Epidemics of typhoid fever, however, have occurred during the last few years, particularly after the snow freshets, and they have forcibly brought the question of water purification to the front. The Bethlehem City Water Company, being desirous of guarding its water supply against any taint or danger from temporary pollution, decided, at the beginning of 1904, to have recourse to filtration.

The first thought was in favor of mechanical filtration, because the first cost of installation is less than that of slow sand filtration. But the water being soft and generally clear it was found that sulphate of alumina would not be decomposed without the addition of alkalies and this would have rendered the cost of maintenance prohibitive. The Late Dr. Brown, Dean of the Lehigh University, expressed a decided preference for slow sand filtration; he was joined in this opinion by the professors of the University and by the general public, and at this particular time information was published showing that the cities in which mechanical filters are used were not free from typhoid fever. The Water Company charged the writer with the duty of designing as complete and perfect a slow sand system of filtration as he knew how with instructions to spare no expense for what would be likely to improve the quality of the water to the highest degree, whilst he was to avoid all unnecessary accessories or embellishments.

The pumping station is confined between the river bank and the Lehigh Valley Railway and there is absolutely no space available for a filter plant of any kind in this location.

The water is pumped into a storage reservoir erected on a hill 265 feet above the river and having a capacity of 15,000,000 gallons. On the slope of the hill and at a lower level, twenty feet below, there is a distributing reservoir containing about 5,000,000 gallons of water.

There was, on one side of the hill, adjoining the basins, a small piece of ground that could be utilized for a filter site and it was found that, by adding to it an embankment, sufficient space could be obtained for the erection of a filter plant. The water would flow from the upper storage reservoir to the filters by gravity and from the filters to the lower basin also by gravity.

GENERAL DESCRIPTION

The nominal capacity of the filter plant is 4,000,000 gallons per day; at present the average consumption is 2,500,000 gallons per day. It is necessary to maintain the lower basin always full of filtered water in order to reach the highest part of the town; so the filters have to be regulated to meet the varying demand of the consumers; this variation, however, is not great because the railway companies take water during the night.

In case of fire, the filtered water basin is allowed to be drawn upon to supply the extra demand so that at no time is it found necessary to let raw water go through the mains.

The water from the upper storage basin comes through a twenty-inch pipe to the far end of the filter house into a gullet three feet wide, eight feet deep, extending the whole width of the building. The admission of water into this influent gullet is regulated by a stop valve, inside the building.

* Digest of a paper read before the last session of the American Water Works Association, held at West Baden, Ind., in May, 1905.—[EDITOR.

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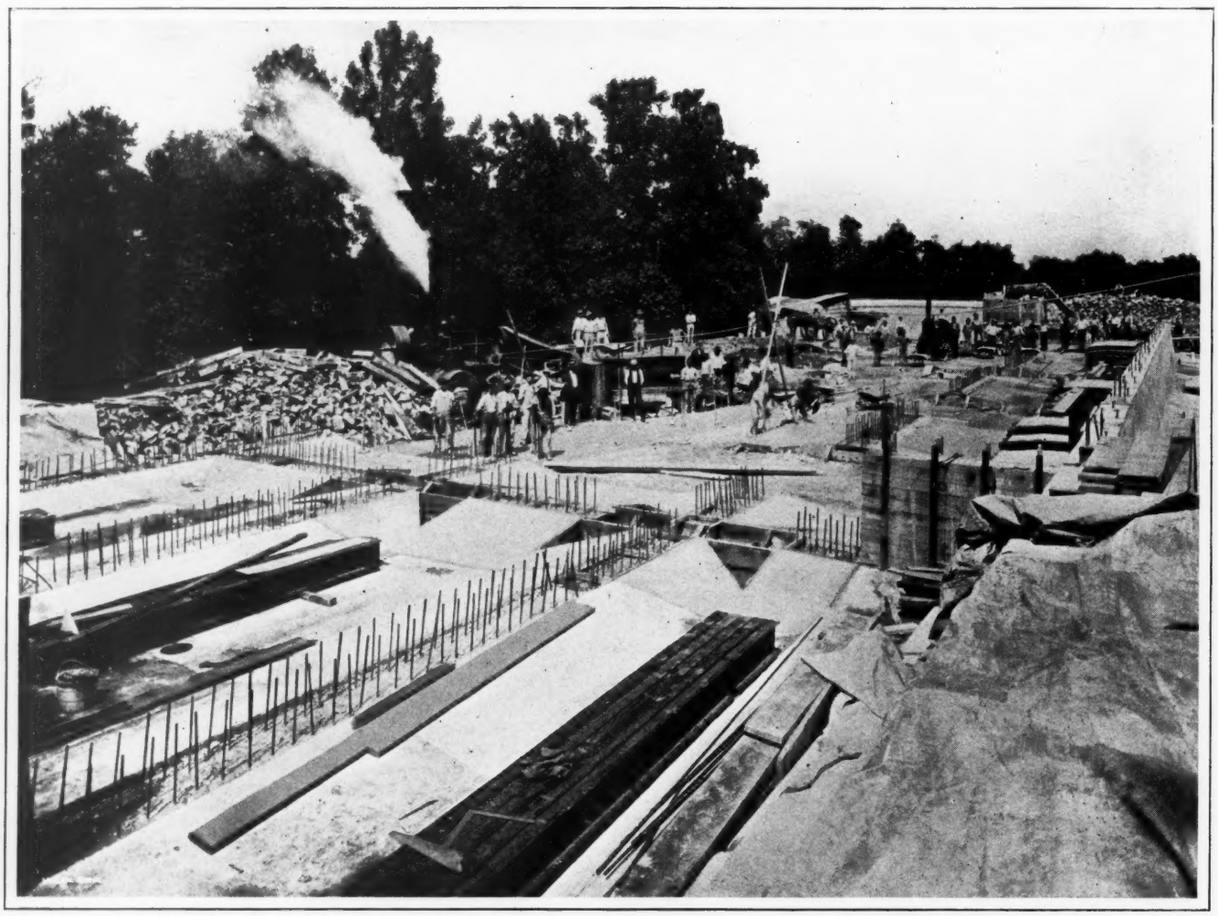
There are six units of scrubbers, sixteen feet wide, thirty-eight feet long, six feet deep; and six units of final filters sixteen feet wide and one hundred and fifty-two feet long and six feet deep. The water from the influent gullet enters the bottom of the scrubbers through eight-inch valves (regulated from the floor over the gullet) and it rises upwardly through the scrubbing materials within six inches or eight inches of the top of the side division walls and flows naturally to the filter beds which are on the same line and are only separated from the scrubbers by a dwarf wall. When in normal operation the level of the water on the scrubbers and on the filters is the same and there is practically no motion on the surface. The only movement that is noticeable is the escape of air at the top of the scrubbers. It should be stated here that the air held in solution by the river water is often the cause of considerable trouble in downward sand filters of the slow sand filter or rapid types; it accumulates in the sand and prevents filtration. This phenomenon has given rise to much discussion on what has been called positive and negative heads, and it has led to the construction of filters with a minimum positive head of four feet (height of water above sand). It so happens that in passing upwardly through the scrubbers, which as is known, are composed of very coarse or open materials, the water frees itself of this "Constitutional" air, and no trouble whatever is met with from the cause in the operation of sand filters, receiving scrubbed water.

In the final filters the water flows downward, in the usual way, through the filtering materials and comes out into the effluent gallery, which is six feet deep, through eight-inch valves which are always submerged in water. Provision is made at the end of each filtered water outlet for wasting the first filtered water through a six-inch valve, attached to a pipe connected with the different filter units, and allowing also back filling with filtered water.

The division and end walls as well as the floors of the scrubbers and final filters are constructed of concrete reinforced throughout with half-inch square iron bars. Wherever the floors are over made-ground, expanded metal has been added to the iron bars. The concrete was worked very wet and was troweled against the forms.



LAYING FLOORS OF REINFORCED CONCRETE—THE IRON RODS SEEN ARE IN THE KEYS OF THE DIVISION WALLS

There have been no settlement cracks, but a few shrinkage cracks have shown themselves in the keys; these were easily repaired and no leak has occurred in the concrete work during the last winter which was particularly severe.

Over the filtered water gallery is a reinforced concrete floor through which the stems of the effluent valves and rewash valves pass. These stems are supported by indicator stands, which help to regulate the flow of water. The space may be called the gate chamber. There is plenty of room

for the manipulation of the valves, the reading of the loss of head gauges and the sampling of each filter unit. The water in the effluent or filtered water gallery is at the same level as in the lower basin, with which it communicates by a twenty-inch cast iron pipe.

The outer concrete walls serve as foundations for the walls of the building, which are made of brick. The roof is of wood with a wide pine ceiling and slag covering; it is supported by cast iron pillars which rest upon the division walls. There are windows every seventeen feet all round the building; the center of the roof is raised and is provided with sidelights. The whole filter house is as light as a living room.

SHOWING THE SCRUBBER AND FILTER TANKS

Drainage and Filter Materials

The distribution system in the scrubbers consists of two six-inch lines of perforated terra cotta pipe laid at the bottom and the drainage system is composed of concrete slabs three feet wide and eight inches high. A twelve-inch washout pipe leads the dirty wash water from the center of the scrubber to the main drain.

The materials used in the scrubbers, beginning from the bottom are:

1. A nine-inch layer of three-inch pebble stones.
2. A nine-inch layer of coke, "egg" size.
3. Twenty-four inches of space is occupied by four rows of slates placed at a slight angle upwardly, each row in a contrary direction, so that the water in its upward flow is compelled to take a circuitous or spiral course. The space between the slates is occupied by coke "nut" size.
4. An eighteen-inch layer of sponge, held down by cedar slats, yellow pine stringers, blocks and steel "I" beams.

The drainage system in the sand beds, or final filters, is similar to that of the scrubbers. It consists of convex slabs made with concrete, with openings at the base. These slabs are laid in the center of the bed of which the floor is dished. A perfect drainage is thus secured, and no stagnant water can remain in any part of the filter bed.

The materials used in the final filters, beginning from the bottom are:

1. Eighteen inches gravel, graded from three inches to three-sixteenths of an inch.
2. Two feet of filter sand.

Cleaning

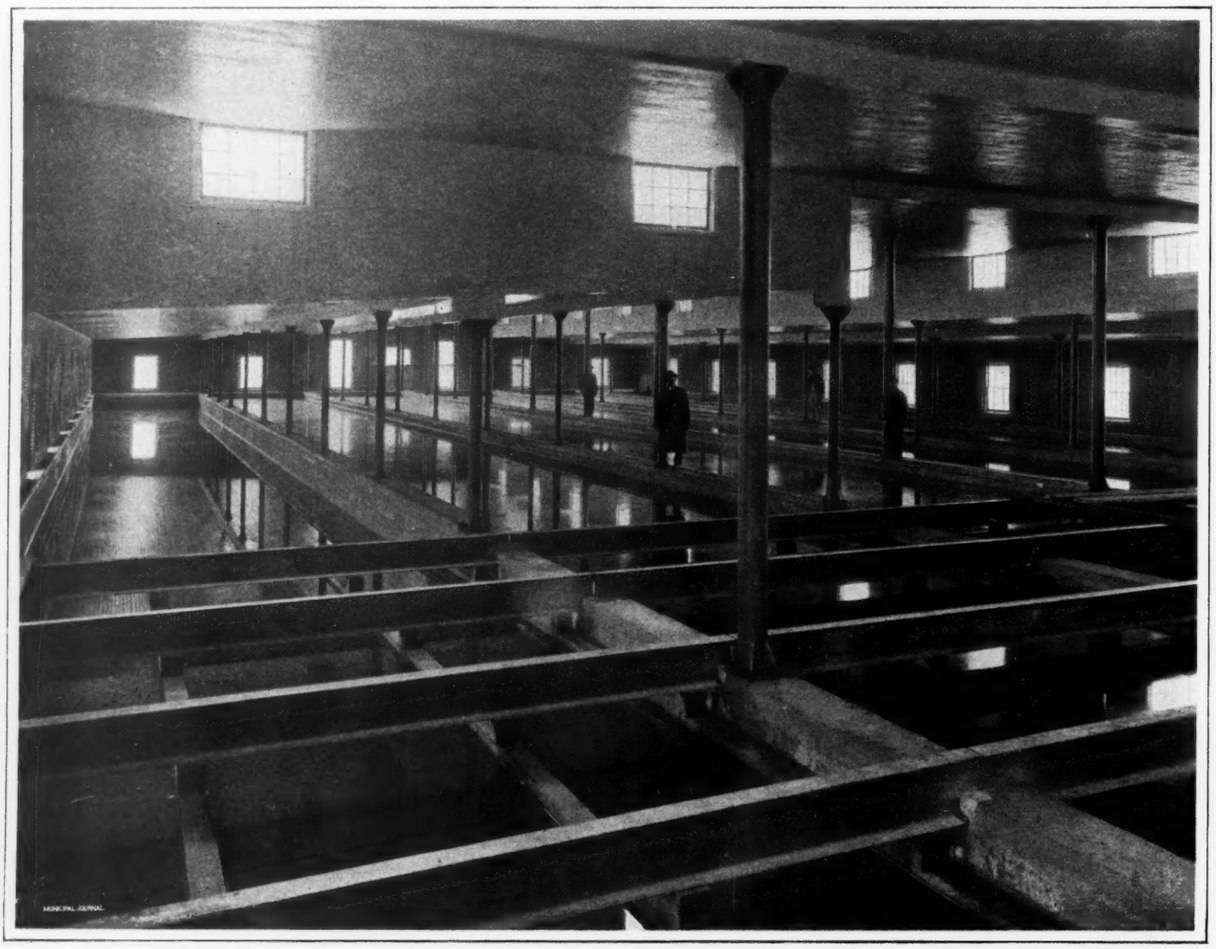
One of the features of the South Bethlehem Plant is the cleaning operation. A yellow pine coping is laid on the division walls and flat steel rails are set thereon. A crane travels on these rails and an arrangement is made for the transfer of the crane from one bed to the other.

The crane is used for the following purposes:

1. A platform attached to the crane is lowered close to

the sand bed for the collection of the dirty sand and it is raised for transfer from one filter unit to another. The man who scrapes the sand stands on the platform, and when the platform is loaded, the crane is pushed toward the sand washer by men walking on the division walls so that at no time have the men to set foot on the sand bed itself. The same device is used to receive the clean sand and distribute it over the bed.

2. The crane and platform are also used to level or plane the sand layer after it is replaced on the bed.



GENERAL VIEW OF THE INTERIOR WHILE PLANT IS IN OPERATION

3. A trough erected on the crane is used for the distribution of artificial filtering membrane, concerning which more will be said on a subsequent occasion.

Sand Washer

The sand washer used at South Bethlehem is an entirely new device. It consists of four bucket elevators with suitable framework, shafting, counter-shafting and a trough. It is operated with an electro-motor which is also used for the sponge washing machinery. The sand washing machine and the sponge washing machine are erected on platforms which are moved on the "I" beams of the scrubbers close to the filter in process of cleaning. The crane and platform bring the dirty sand to the washer; it is shoveled from the platform into a boot not more than two feet high, where it is taken up by the first elevator. It is raised some nine feet in the air and then made to drop with a certain force into the water of the trough below; the sand is taken up again by a second elevator, raised and dropped in the water below. It is lifted a third time and again thrown into the water; the fourth and last time it is raised from the washing trough and falls in a chute which leads the clean sand to the traveling crane for distribution on the bed. In this process each particle of sand comes in direct contact, more or less violent with the water which it strikes. It is freed from mud by the force of impact. The sand is handled in very small quantities at a time, is not subject to the law of currents and never forms any stratification.

The wash water enters in the trough from the far end which receives the clean sand and goes out at the near end which receives the dirty sand. The flow is regulated so as not to carry away any of the fine sand.

The following are some of the advantages of this new system:

1. Very little water is required; it need not be filtered water, nor has it to be under pressure.

2. The sand is washed as soon as scraped without remaining in heaps, in courts, exposed to wind, rain, frost, dust, etc.

3. The sand being washed fresh, the mud comes off easily, and being replaced on the bed as soon as washed, the filtering layer is always of the same thickness.

4. The sand is at no time stratified as is the case with the ordinary methods of washing.

5. Nor is there at any time any waste or separation of the finer particles of sand, which are absolutely necessary to produce good filtration. By the ordinary system of washing sand, there is a considerable separation of the different sizes of particles according to their specific gravity, and much waste of the finest particles; this renders the efficiency of the filter less and less after each cleaning. With the system inaugurated at South Bethlehem the physical condition of the sand is always the same.

Operation

The work of the South Bethlehem scrubbers has been so efficaciously performed that the sand filters have required but one scraping since the plant was put in operation six months ago. The fine culm agglomerated on the surface of the scrubbers has been utilized to form a natural "Schmutzdecke" or filtering membrane on the sand. Once a month, the water in the final filters has been lowered and the sand has been raked half an inch deep. The sand being discolored fully one and one-half inches deep the main part of the so-called "Schmutzdecke" was not disturbed by the surface raking, and the speed has been maintained without any reduction in the quality of the filtered water. With a view to obtain from this filter plant the highest possible degree of efficiency and the greatest yield, it will in future be worked with artificial filtering membrane, preferably with asbestos fiber, deposited on the surface of the sand, as described by the writer on previous occasions, notably at the New York Convention.

What we want here to emphasize as points worthy of interest in the South Bethlehem plant are the following features:

1. Light and well ventilated filter house.

2. Narrow filter beds and comparatively small units—one-eighteenth of an acre instead of the usual large units of half, three-quarter, or whole acre.

3. Shallow layer of water over the sand bed, showing the possibility of reducing the height of the filter walls to a minimum.

4. Cleaning without tramping on the sand.

5. Washing the sand without losing the fine particles, or separating it in different grades.

6. Avoiding sand courts with the waste and pollution resulting from exposure.

7. High speed of filtration from six to nine million gallons per acre, per day.

8. Long runs of three months or more without scraping.

9. No coagulation.

10. Facilities for distributing and removing the filtering materials, and the artificial membranes.

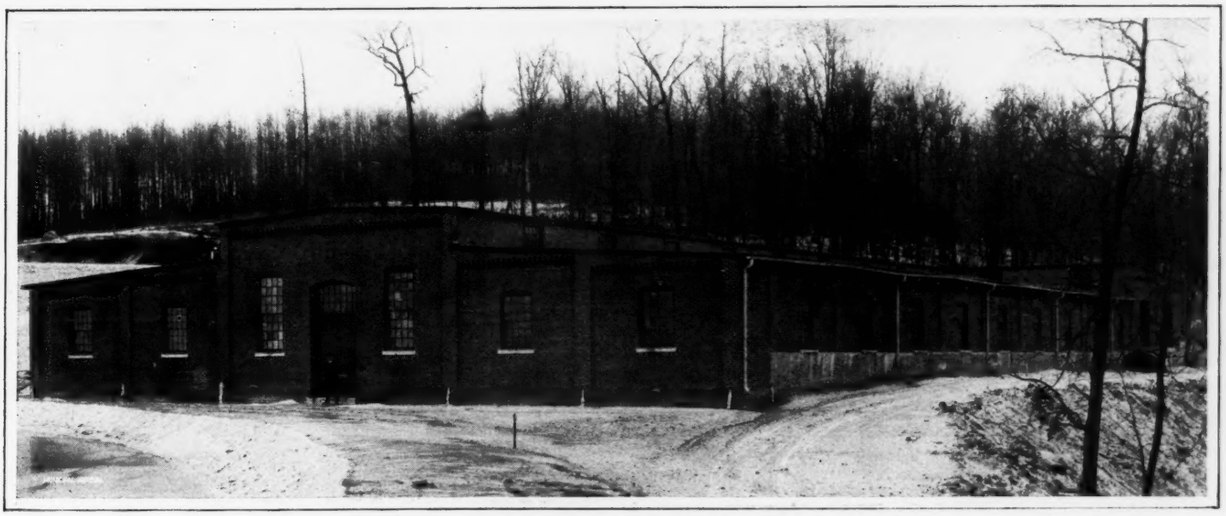
11. Compactness, simplicity and easy control of the whole plant.

12. No constant labor of any kind. The attendant hitherto in charge of the reservoirs, regulates the flow of water through the filters, to suit the requirements of the town. He attends to the filter valves instead of the reservoir valves.

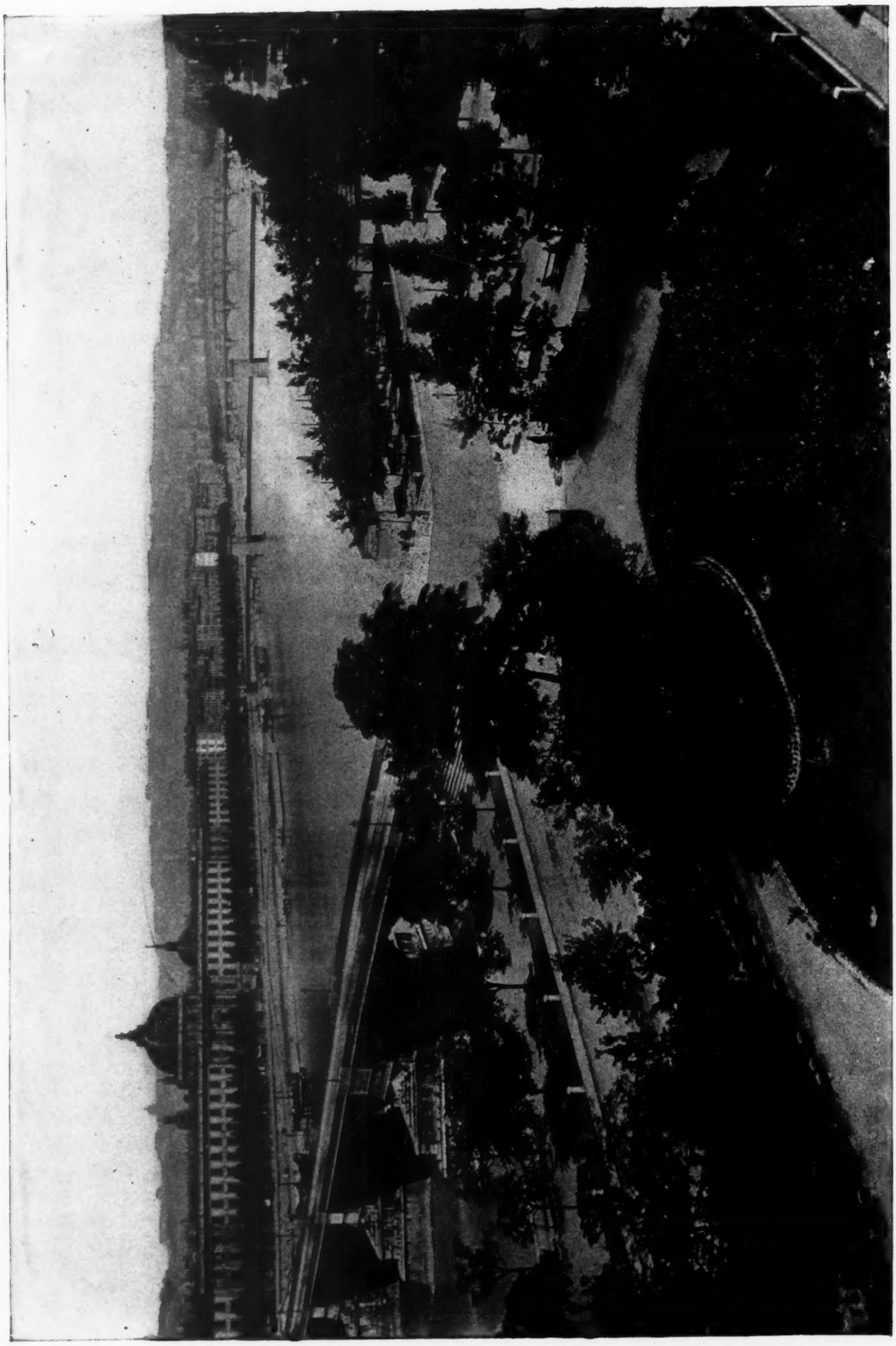
13. When a cleaning operation is necessary, it is carried on by the ordinary staff of the water company.

14. The mechanical power required for all the washing operations is supplied by a five horse-power electrical motor.

The water is examined daily through a two-foot tube. The filtered water must be absolutely brilliant. That of the scrubbers may be slightly yellow but must be clean. Of course the water in the effluent gullet viewed through the tube appears always dark brown or quite black. If any individual final filter does not give the desired brilliancy, the speed is reduced. The loss of head gauges indicate when it is necessary to perform cleaning operations.



EXTERIOR VIEW OF THE SOUTH BETHLEHEM FILTER PLANT



SUGGESTIONS FOR THE WEST BANK OF THE SCHUYLKILL, PHILADELPHIA. THE PLACE RASPAIL, THE PONT DE LA GUILLOTIÈRE, AND OTHER BRIDGES ACROSS THE RHONE AT LYONS

WOOD PAVING

Valuable Information about the Use of Wood Paving in English Cities—Treated Wood Block Pavement Growing in Favor in America

*By T. H. Scott**

However suitable granite, whinston, or stone setts of any description may be as a paving material in the vicinity of large works, warehouses, docks, or streets where the traffic is of a heavy nature, or where a hard, durable surface is necessary, it is apparent that in shop streets the intolerable noise which results from their use must in the near future put an end to them, excepting in special circumstances, such as towns situated in close proximity to quarries, where, for obvious reasons, their use may be continued. I do not for a moment suggest that wood paving is by any means the last word which is going to be said regarding street surfaces; on the contrary, I believe a better and more durable material will yet be found. While that is so, however, a good hard wood, properly laid, has few equals, and I question if, at the present time, it has any superiors as a paving material for busy shopping thoroughfares. It is contended by some people that wood is porous and unsanitary, that it is not so durable, and is, consequently, more expensive than stone setts. There can be little doubt that the soft woods have given rise to the complaints on hygienic grounds; soft wood is undoubtedly apt to become noxious, particularly if uncreosoted, in the vicinity of cabstands, but there is no reasonable ground for complaint under this head with hard wood; it is laid on one of the finest streets in Europe—viz., Princes street, Edinburgh—and found to be quite satisfactory.

Regarding durability wood can certainly not be compared to granite and whinstone, but there is scarcely another head under which it is not superior. It is practically noiseless, gives the minimum of traction, asphalt excepted, affords a foothold for horses, is easily cleansed, and dries quickly. Amongst the first places where wood was tried in this country was in front of the Old Bailey in 1839; since then a large number of different classes have been tested, including all the better known soft and hard woods. Probably one of the best soft materials is Baltic redwood, and of hard woods which have been thoroughly tested here, so far as I am aware, nothing has yet excelled Australian Karri and Jarrah. California and Australian gums promise well, and the latter has unquestionably had a comparatively long life in Sydney, but neither have as yet been subjected for a sufficient length of time to the conditions which obtain in Britain to warrant a strong recommendation.

Whatever wood is adopted it should be thoroughly seasoned, sound, free from knots, shakes, and sap, close grained, and of uniform quality. Care should be taken to cut the blocks die square. Soft wood should never be used without creosoting; this acts as a preservative, and probably adds about 75 per cent. to the life of the block, and also reduces absorption and swelling. Creosoting is better to be done naturally by steeping for a sufficient length of time to impregnate the block, rather than by injection under pressure. It has been found that in creosoting small blocks, such as are used for wood paving, under pressure, the fiber is frequently damaged, when it is of the last importance to preserve the fiber in its natural state. It is a *sine qua non* that before creosoting the wood should be thoroughly seasoned, otherwise fermentation is set up, and rapid deterioration follows. A good creosote is made of oil tar, which must be freed of all ammoniacal liquor, and contain not less than 5 per cent. of tar acids.

In provincial towns creosoted soft wood has frequently a life of from twelve to fifteen years, and hard wood under similar conditions from fifteen to eighteen years. As can be readily understood, of course, much depends upon the nature of the traffic, and under different conditions the life of the same material varies considerably.

It is noteworthy that the London County Council grant loans for Karri and Jarrah for a period of two years in excess of what is allowed for other wood, or, in other words, something like 40 per cent. of additional life is calculated to be got out of it. In Edinburgh the life of hard wood is estimated at from twelve to fifteen years, while in Paddington and Holborn it is from eight to ten years.

Under certain conditions it has been proved that Karri and Jarrah have wearing properties to the extent of about six times those of yellow deal, *i. e.*, where Karri and Jarrah wear ⅛ in., under similar circumstances deal wears about ¾ in. In some instances, again, the discrepancy is not so great, as, for instance, in the Strand near Exeter Hall, where Jarrah has worn down at the rate of ¼ in. per annum, while the deal which it replaced lost ⅝ in. per annum. As an illustration of the effect of a heavy traffic, it is of interest to note that at St. Pancras Church, with a traffic of 411,318 tons per yard of width per annum, the greatest wear of Jarrah was .18 of an inch, or less than 1/5 in., per annum. In other streets in the Lambeth Vestry the wear has only amounted to ¼ in. for 5½ years.

In considering all the *pros* and *cons* relating to soft and hard wood, it appears that, speaking generally, although hard wood paving may involve additional initial outlay, it is more economical in the end. It will be observed from the accompanying table that 6 in. of concrete is the favorite foundation. It is unmistakably the best which has yet been used, excepting that access to pipes is somewhat difficult. No one, however, who has seen the effects of a weak foundation would venture to suggest that, for heavy traffic, it is unnecessarily expensive. While that is so, however, one cannot dogmatize upon the subject. For instance, with a

* Burgh Surveyor, Peterhead, N. B.

moderate traffic, it is possible to make a satisfactory foundation with 4 in. or ordinary well-rammed metal bottoming and 2 in. of concrete. It is well to allow concrete foundations to set for about eight or nine days before commencing to lay the blocks. Looking back, it is somewhat interesting and instructive to glance at the various more or less complicated methods which have from time to time been adopted in laying wood paving. These may be summarised as follows, viz.:—(1) Methods for tying or interlocking the blocks to distribute the load and prevent upheaval; (2) wide joints extending to about an inch in some cases; (3) cushioning between the foundations and the blocks with sand, gravel, asphalt, felt, etc.; (4) laying with the grain of the wood at various angles to the traffic.

In modern practice all these are practically abandoned, as not only cumbersome, troublesome, and expensive, but as

City or town.	To what extent have you adopted wood paving?	What class of wood do you consider most suitable?	How long has the paving been down?	Up to what gradient do you find it expedient to lay wood?
Blackpool	A very great extent.	Karri and Jarrah.	8 to 10 years.	About 1 in 33.
*St. Pancras, London	Have laid nothing else on main roads for 10 years.	Jarrah.	11 years.	About 1 in 30.
Glasgow	Portions of seven streets.	Hardwood.	Each street differs; maximum about six years.	1 in 40.
Edinburgh	To the extent of 19,960 superficial yards.	The best hard wood.	Began to lay wood paving in this city in 1873, and have laid it more or less since then. We estimate the life of hardwood at from 12 to 15 years, according to traffic.	About 1 in 30.
Birmingham	12 miles.	Soft wood and hard wood.	Soft wood paving for about 30 years, hardwood 6 years.	1 in 40.
Harrogate	2,000 square yards.	Hardwood.	8 years.	—
Manchester	About 27,000 square yards.	Australian Karr wood.	Our estimate of the life of the above class of pavement is for 5 in., say, 10 years first life. Second life, after blocks have been turned and defective ones cast out, say, 5 to 6 years.	Steepest gradient laid with wood is 1 in 35.
Leeds	About 3 miles of street.	Mostly creosoted red wood.	Length of time varies in different streets; 5 to 10 years.	To about 1 in 30. We have laid it on steeper gradients, but only for very short lengths.
Paddington, London	Wood-paved roadways have been adopted since the year 1877 to an extent at the present time of about 12 miles.	Creosoted deal is now being used, but a precise comparison between it and Australian hard wood is not yet available, as neither variety has been used a sufficiently long time in Paddington.	Plain deal requires relaying every 8 to 10 years.	Best not laid on a gradient. Limit of gradient depends on kind of traffic and other circumstances, viz., between 1 in 30 and 1 in 20.
Liverpool	118,413 superficial yards are at present laid.	Australian hard wood and creosoted red pine.	The oldest paving was laid in 1893.	The steepest gradient on which they have been laid is 1 in 32.
Scarborough	No wood paving up to the present, but are about to lay down 5,325 yards.	Propose to use creosoted deal paving.	—	—
Holborn	This borough first laid wood paving in the year 1875, and has since that date laid large areas, which have in a number of cases been removed when worn out and asphalt substituted.	I have used various descriptions of wood, but consider a good quality fir the most suitable.	Eight years may be taken as the life of good soft woods, and perhaps a year or two longer of hard woods.	1 in 35.
Belfast	A few short lengths.	Jarrah wood.	Two years.	Streets are practically level.

*Remarks.—Prices of local labor and materials and cartage greatly influence cost.

unnecessary, and even detrimental. In the early days it was thought that there was great danger of the blocks rising unless they were interlocked in some way. A common method adopted was by doweling with wooden pins; another practice was to accomplish the same end by using the material composing the joint to fill the bore holes when in a plastic state. There were several other methods, which need not be enumerated here; suffice it to say that interlocking is quite unnecessary. The wide joint has the effect, after being exposed to the weather for a time, of actually

What sizes of blocks and joints do you recommend?	What does the foundation consist of?	What camber do you find most suitable from crown to channel?	At what price can such paving be laid per superficial yard?	Do you consider wood suitable for general traffic, and preferable to granite setts in chief thoroughfares?
9 in. or 6 in. by 3 in. by 4½ in. deep. Close joints.	6 in. Portland cement concrete.	½ span / 40	12s. per superficial yard complete with foundation.	Yes.
5 in. or 4 in. deep by 3 in. by 9 in. Joints about 1-10 in., grouted with pitch creosote oil.	Portland cement concrete	1 in. in 40 at least.	17s. 6d. per yard as maximum where old macadam has to be removed, or 12s. 6d. if old concrete only requires facing.	For shop streets where quiet is essential, yes; for warehouse streets, with slow, heavy traffic, prefer granite.
We lay 9 in. by 5 in. by 3 in., as close as possible.	6 in. concrete.	Depends on width of street and longitudinal gradient. Averages 5 in.	16s. 6d. per square yard.	More costly in maintenance; otherwise preferable.
Block 9 in. long by 3 in. wide by 5 in. deep.	6 in. of Portland cement concrete, finished with a smooth surface, 1 in. thick.	Say 1 in. on 3 ft.	Australian hardwood 17s. to 18s. per superficial yard (finished).	First, quite suitable; second, wood is preferable when it is desirable to have little noise.
Hardwood, 4 in. by 3 in. by 9 in., 4 in. by 3 in. by 8 in., 4 in. by 3 in. by 7 in. Soft wood, 5 in. by 3 in. by 9 in., 5 in. by 3 in. by 8 in., 6 in. by 3 in. by 8 in.	2 of sand, 5 hard metal, and 1 of screenings to 1 of cement concrete.	1 in 36 soft wood; 1 in 45 hardwood.	Hardwood, 16s.; soft wood, 13s. 6d.	Yes.
—	6 in. cement concrete.	—	Cost 16s. 3d., including foundation.	Yes, where gradient is not excessive.
9 in. long, 3 in. wide and 5 in. deep. Length joints close and end joints ⅛ in. to ¼ in. open.	6 in. of Portland cement concrete.	Lay paving with a fall of 1 in. in 72 from the centre of the carriageway to the channel.	About 19s. per square yard.	We consider granite sett pavement the best in respect of durability, and therefore cheapness. The sole merit of wood pavement is its noiselessness.
3 in. by 5 in. block; ⅜ in. joints.	Portland cement concrete 6 in. deep and cement floating 3 in. deep.	About 1 in 40.	Creosoted red wood paving, per superficial yard, 8s. 6d.; concreting and floating, 18s. per cu. yard.	Yes, if not too heavy. Prefer it to granite setts in principal streets in centre of town.
Depend on wood to be used and the amount of traffic and market prices of various sizes. Depth, say, as a standard, 4 in. for Jarrah and 5 in. for creosoted deal, subject to variation.	Portland cement concrete 1 to 6, floated with 1 in. of cement and sand 1 to 3.	⅜ in. to the foot.	Depends entirely on market prices of wood in any particular locality.	Granite setts preferable in every way, except as regards freedom from noise.
5 in. deep, 3 in. wide, 9 in. long, width ways laid tight up, end ways about ⅛ in. open. Joint next curve 1½ in. wide.	Concrete 5 in. to 6 in. deep, costing on an average 3s. 6d. per superficial yard.	1 in 48.	At present from 14s. to 15s. per superficial yard.	Yes, in business streets with constant vehicular traffic, and also opposite hospitals, institutes and churches.
—	—	—	—	
3 in. by 9 in. by 5 in., and 3-16 in. joints.	Portland cement concrete 6 in. thick.	1 in. to 6 ft. of total width of carriageway.	Hardwood 14s. to 14s. 6d. and soft wood 11s. to 12s.	On the ground of noise and cleanliness wood paving is to be preferred to granite. As regards life and cost, granite is more lasting, and on that account less expensive than wood.
—	—	—	—	Wood paving is not suitable for heavy traffic. Its cost at the end of 15 years or so amounts to more than double that of stone pavement in the same time.

Character of street and rateable value must affect the conclusion as to adopting wood or not.

deteriorating the paving, as it becomes disintegrated, and more or less open, forming a lodgment for liquid and mud. Moreover, the arrises get worn off, the blocks are inclined to warp, and a corrugated surface is formed, which increases the traction and cleansing necessary, and the whole pavement has a tendency to become more or less insanitary. The joints have, therefore, gradually been reduced in width until in many instances the blocks are now placed as close as is practicable, the joints being merely grouted with a bituminous mixture of hot tar and pitch, and this is no doubt the best joint. Cement has also been used for grouting, but owing to its liability to disintegrate it is found to be unsatisfactory.

I have not observed any advantage from cushioning between the foundation and the blocks. Indeed, sand may conceivably be detrimental; as, for instance, if from any cause water should gain access to the cushion, the sand becomes mobile, and, following the convexity of the foundation, has a tendency to slip from the crown towards the channel, leaving the crown or haunches, where the largest traffic usually is, with a reduced cushion. This can, of course, only take place to a very limited extent, but it is sufficient to produce irregularities on the surface, and ought to be avoided. All sorts of angles for the grain have been tried, but unquestionably the best results are obtained with the fibre placed vertically, *i. e.*, at right angles to the surface.

Briefly, experience points to simplicity of construction. The size of block mostly used is 9 by 5 by 3, but on a well-finished foundation hardwood blocks, 9 by 4 by 3, closely jointed, will be found to give a good account of themselves. Comparatively steep gradients have been laid with wood, as, for instance, Savoy street and Arundel street, London, the former of which has a gradient of 1 in 12 and the latter 1 in 14. In modern practice, however, it is not customary to lay wood on gradients under 1 in 30, unless for very short distances. In laying any kind of wood, expansion must be allowed for near the kerbs by leaving a space filled with some elastic material. These ought to be about 1½ in. in width for hard wood and 2½ in. to 3 in. for soft wood. Opinions on a number of important points are given in the table by the engineers to the various towns mentioned, all of which are well worthy of consideration. Finally, I would add that wood, if properly laid, is easily cleansed, and ought to be cleansed frequently, otherwise a greasy film is formed on the surface which may become dangerous to the vehicular traffic and disagreeable to pedestrains.

HIGHWAYS OF FRANCE*

An Inspection of the Boulevards and Avenues of Paris and Roads of the Surrounding District—Service of the Public Ways

By William Ballantine

The roads in France, as in this country, were for several centuries after the decline and fall of the Roman power, in a very dilapidated state, as the result of simple neglect. Louis XIV. in the latter part of the seventeenth century made some good roads in the vicinity of Paris, but it was not until the end of the eighteenth century (1775) that the real work of roadmaking throughout the country began. It was in the time of Napoleon I that most of the great national roads which run through the country in various directions were constructed. These roads were made largely for military purposes, and connect the chief towns and the French frontiers with Paris. Besides the leading roads there are also many other roads varying in degrees of importance.

The following is the classification of roads in France:

(1) Routes Nationales.—They are constructed and maintained by the National Government.

(2) Routes Departmentales.—They are constructed and maintained by the several departments at national expense.

(3) Chemins Vicinaux de Grande Communication.—These roads pass through, and connect, two or more communes, and are maintained by the communes interested, and served by them, aided by Government grant.

(4) Chemins Vicinaux de Moyenne Communication.—These roads are similar to Class III, but of less importance, and are maintained at the cost of the communes, but controlled by the department.

(5) Chemins Petite Communication.—These are of still less importance, maintained by the communes separately under the supervision of the Government engineers.

(6) Chemins Ruraux.—These are roads of the least importance, and are wholly controlled and maintained by the communes without any interference from the Government officials. The last three classes may be described as "Parish" roads.

The roads, so far as we could see them between Boulogne and Paris and 30 miles out from the city, are for the most part flat. The standard of grade adopted in France is—for national routes, 3 in 100; departmental, 4 in 100; subordinate, 5 in 100; and, excepting in hilly districts or when the traffic is too small to warrant the extra expenditure in keeping down the grade, this standard has been generally adopted. For this reason, no doubt, as well as the climate, it has been found a good country for cycling, but on the other hand it is not so good for obtaining the use of the free wheel.

The best type of road visited was the national route, leading from Paris through Fontainebleau towards Lyons. A sketch of it was made near the Croix d'Augas and is herewith

* This report on French roads, by Mr. William Ballantine, of Falkirk, is the outcome of a visit to Paris and the surrounding district, and forms part of an interesting pamphlet in which the circumstances leading up to the visit, and the programme carried out during the four days set apart for it are fully detailed. The deputation was composed of twelve Scottish road surveyors, who were most cordially received and assisted by the chief municipal officials of Paris. The report was published in "The Surveyor and Municipal and County Engineer," London, England.—[Editor.

reproduced as an example of the best type of French national roads. (Fig. 1.) This portion of the road was originally paved, but six years ago the paving was lifted, the road bottomed and macadamized (9 in. bottoming and 6 in. metal), and although the surface had not been much repaired since, it was still in excellent condition. The road is kerbed on both sides with run channels 3 feet broad of paving blocks. Behind the curb on either side is a row of trees planted fifty years ago, and now in excellent form. Beyond the trees are paths 9 feet wide for the use of horsemen. At intervals it was noticed that the curb was either lowered or a grass verge substituted to allow of a rider going off or on to the riding path. A special feature of this road was its straight lines and slightly undulating gradient. Such a great length of straight road, however, makes it rather monotonous to travel upon.

Some of these national roads, which at an earlier period were largely used for military purposes, were originally paved with stone blocks. Some of these we saw still in existence, near Versailles, but most of the paving has now been lifted, the stones used for bottoming and the surface macadamized.

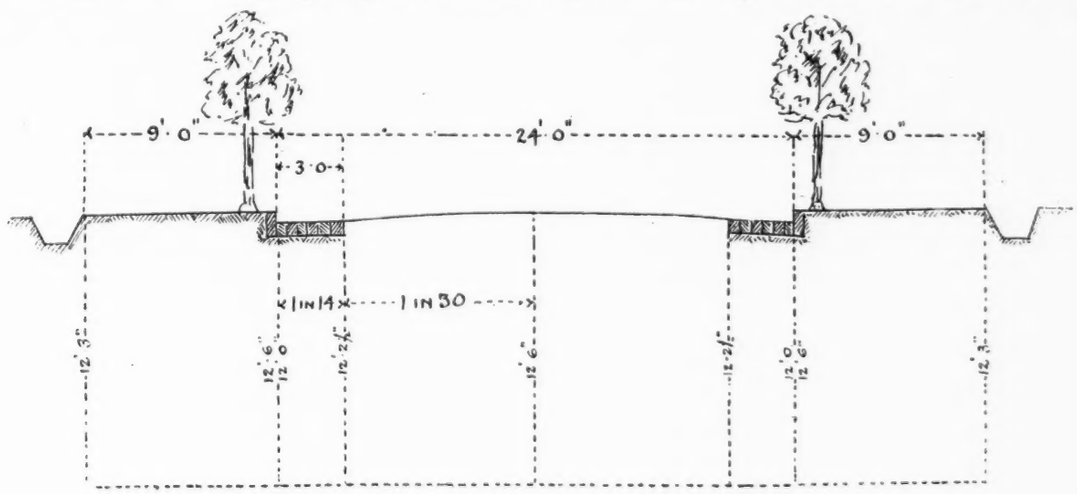


Fig. 1.

In the early period of the construction of these roads, the earth formation was made horizontal, and the bottoming 18 in. thick on the middle, and 12 in. at the sides, the convexity of the surface being formed with the materials, but Trèsaguet, a French engineer, thought this thickness excessive, and introduced the rounded form of the earth formation and only 10 in. of bottoming from side to side, and this is the method now almost generally adopted, both in France and in this country. Of course, only some of the best roads in France are so constructed. Only 9,000 miles out of 22,000 of the national routes have a hand set foundation, the others being what are termed "broken stone roads"—the stone used is broken in pieces and laid on promiscuously, after the system introduced by Macadam. Some of the lower class roads are constructed of gravel, and others of earth.

The materials used in the construction and maintenance of the roads vary according to the kind of stone found locally in the various departments of the country. On the roads visited, the materials in use were white flints, millstone grit, and flinty sandstone. These are found in abundance in the locality. The millstone grit is dug out of the ground 3 ft. or 4 ft. below the surface, and the flinty sandstone is got in quarries such as the quarry of Marechaux, a description of which will be found under notes on Paris. A standard of quality of road materials has been adopted in France in order to determine the relative qualities of the various kinds of stones found in the country. The scale ranges from 0 to 20, porphyry being the best, ranging from 10 to 20, and the pudding stone of least strength, varying from 4 to 8. Compared with this standard, the materials we saw in use in the departments of Seine and Marne were of medium quality, ranging from 8 to 13 of the fixed standard. These materials, it will be seen, are not of the highest quality; nevertheless, it is evidently thought better economy to use the cheaper stone in the district than the better quality brought from a distance at nearly three times the cost of the local stone.

These flinty freestones, while they seemed to wear fairly well under ordinary conditions, gradually grind down under the traffic into very fine white sand, and it is this that causes so much dust on the roads in dry weather. On the surface of almost all the roads visited there was found, more or less thick, this layer of fine white sand. When it becomes too thick it is removed into heaps on the margin of the road. But, although this sand is a great nuisance in respect to the dust it causes, it has also its advantages, in that its presence, to some extent, on the surface, helps to prevent the breaking up of the macadam in time of drought, and it does not cause mud in wet weather, as the sandy particles soon dry up after rain, and therefore there is no mud to deal with as we have in this country.

These national routes are maintained with great care, and excellent management is bestowed upon them, though the latter seemed to us to be rather costly.

The heavier part of the work of repair is done by squards of six men in charge of a competent overseer, and the lighter work of watching and keeping the channels in order is left to a cantonnier or surfaceman on a specified length of the road. The lengths are marked by milestones—quarter, half and three-quarter miles. Each cantonnier is distinguished by a number. His number on a plate is affixed to a pole which he sticks up on the road side where he is working for

the day, with the head of the pole inclining in the direction in which he is working, and every day the cantonnier is visited by an inspector, who enters in a book for the purpose the part of the road where he is working, his work and conduct. The cantonniers are of three classes: beginning at the lower grade, they rise to a higher on the recommendation of the chief cantonnier. The hours of labor are: May 1 to September 1, from 5 A. M. to 7 P. M., with two hours for meals, but in very hot weather this may be extended to three hours. The rest of the year is from sunrise to sunset. They provide their own ordinary tools, while the administration provides special tools. The pay of the ordinary cantonnier is from 56 to 60 cents per day.

Great care has always been bestowed by the French engineers on the patching of the surface of the first-class roads. In repairing holes and small depressions, these are marked round with a pick after rain, the space within loosened, the material taken out, cleaned, and put back with the addition of new material, and the whole then made solid with a pounder. This is an excellent plan, but takes up considerable time, a roadman not being able to use at this work more than a cubic yard of stone per day.

For ordinary patching when there is no roller, the patches are put on systematically without regard to any depression, first along the middle of the road at spaces of 50 or 60 yards apart. The traffic passing on both sides gradually wears over on the new metal when these have been partially consolidated, the patches are then put on the sides, right and left midway between the former center patches, and the third coating between the second set and so on till the whole surface is coated.

Now that steam road-rolling has become almost universal, this system of patching is being discarded and the whole width of road coated and rolled at one operation.

One of the best parts of road repair work that we saw in operation was the recharging or recoating a part of the road near Melun. The broken metal, having been laid in heaps on the margin of the road, was filled into barrows with nine-pronged grapes, 15 in. long, 9 in. broad at the heel, and 12 in. at the point of the prongs. The outside prongs are straight to hold the metal, the others are bellied to the extent of 2 in. between heel and point. It is fitted with a straight handle about 6 ft. long, and the workmen handle it very deftly. This method of filling sizes the stones and allows the small pieces and débris to fall through the prongs of the grape.

The barrows are emptied on the road and spread with a rake by one man who regulates the material to the given thickness; not spread with a shovel, as is our custom. This has the effect of making the whole coating of about equal strength and the surface is less liable to wear into holes. The small stuff left by the cleaning process is used for patching or binding. The metal being spread to the desired thickness (in this case it was 6 in. before being rolled) is then watered and rolled hard before applying the binding material. The binding used is sharp, sandy, yellow gravel, of which there seems to be an abundant supply in the district visited. This binding makes a very hard, clean surface, but after it is dry there will no doubt be the usual amount of dust.

Particular notice was here made of the excellent type of road roller in use, which was constructed with upright boiler and rollers of equal size back and front. The weight (17 tons) was much better distributed in this machine than those in use in this country, but it is found not to be so well adapted for hills, or going round turns on narrow roads. One of the same type, but of newer construction, was seen working in Paris on the Avenue de Wagram, its weight being 18,300 kilos, and the cost $3,600. There were no scarifiers attached to any of these rollers. The French engineers have not adopted the practice of picking up the old surface before applying a new coat. If the coating is not for the whole width of the road a furrow is drawn with the pick to ensure a better union of the metal at the edges of the coat, but beyond that they do not believe in breaking up an already compacted surface. A proper scaping or sweeping lays bare the old surface and prepares it for union with the new material.

For the purpose of management and maintenance the roads are divided into departments, and the money required for their upkeep is apportioned to each, in proportion to the amount of traffic on the several roads. In order to arrive at a proper distribution every six or seven years a commission of competent officials takes a census of the traffic, at different points, and at different periods in the year, and the results of these observations are supposed to give a close approximaton of the amount of traffic, the tear and wear of the road, and the amount required or its upkeep. The travel on the several departments, at the last census, varied from 100 to 400 "units," the average on the national roads being 170 in twenty-four hours.

From the official report of 1893, it appears that the mileage and cost of maintenance of roads in France was as follows:

TOTAL COST OF LABOR AND MATERIALS

	Miles.	Annual total cost.	Annual cost per mile.	
Routes Nationales	22,000	$4,514,060	$230	During year 1893
Routes Departmentales..	16,188	2,911,170	180	Annual average
Grandes Vicinaux	128,523	16,494,895	130	for three years
Petits Vicinaux	155,093	8,842,225	55	1886, 1887, 1888
	321,803	$32,762,350		

The above is for material and labor on the carriageways only. About 45 per cent. is added to the above for upkeep of watercourses, sidewalks, planting trees, and general administration.

From last year's report of the engineer-in-chief of the Department of Seine and Marne, it is found that the cost of the ten Routes Nationales passing through that department was $114,293.20. The length of roads is 517 kilometres. This gives an average cost of $220.80 per kilometre, or about $405 per English mile.

The forty-one Routes Departmentales in the same department show a total length of 1,042,173 metres, of which 43,350 metres are paved, and 998,819 metres macadamized. The sum spent in the year 1902 was $210,907.60, being $202.40 per kilometre, or about $370 per English mile.

Excepting for 10 or 12 miles around Paris, the vehicular traffic on the country roads does not seem to be in any way excessive. Indeed, so far as could be seen, there is less traffic than on many of the county roads in Scotland. The style of vehicles in France is much different from ours.

They carry their farm and garden produce, wood, stone, etc., into the city in large wagons, having broad-tired wheels six to seven feet in diameter. These wagons are more easily hauled, and do less damage to the roads than the narrow-tired, low-wheeled vehicles in use elsewhere. The horses in Paris and in the country are all plain shod, no heels or toes, acting like so many picks on the road surface, as is the case with our heavy draught horses. Many of the wagons are drawn by oxen, whose unshod feet do not injure the roads, and, generally, there seems to be but a very moderate amount of traffic, and that not so destructive to the roads as ours.

The motor-car traffic is evidently going to be the most trying on the surface of the roads, especially when they travel at a high rate of speed. Motors are very prevalent in France. In the city of Paris every third or fourth vehicle is a motor, and they were also seen in large numbers on the country roads out from the city. They are not restricted as to speed, but they are all registered, and each carries the registered number. Having been much longer in use there than in this country, the horses have got quite accustomed to their appearance on the roads and streets and we saw no cases of horses being frightened. The cars glide very swiftly and noiselessly along the wood-paved avenues of the city and seem to be under greater control than the horse-drawn vehicles. In the country, too, they travel at a high rate of speed, and it is that which raises the fine, sand dust, exposes the macadam and ultimately breaks up the surface. After the passing of a fast motor with pneumatic tires, we examined the track of the wheels on the road and found the binding displaced and the stones laid bare. M. Hende, chief engineer of the Department of Seine and Marne, states that up to 15 miles an hour the motors do little or no harm to the roads, but when they increase to over 20 or 30 miles an hour they do much damage to the surface and it is quite possible that on this ground alone the speed may yet have to be restricted.

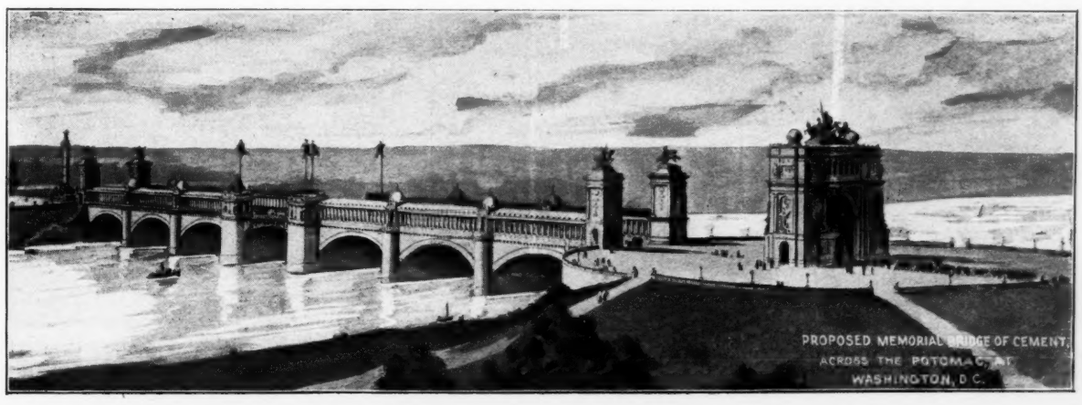
In consequence of this newer and faster mode of traveling, it is being found that on some parts of the roads the convexity of the surface is too great, and especially at curves where fast motors frequently skid on the rounded surface. To obviate this, we were shown part of the road near the Croix d'Angas, where the outer side of the curve had been raised 4 inches above the center of the road, in somewhat the same manner as on the curve of a railway.

The motor-car traffic in France has also raised what is now spoken of as the dust problem, and the authorities have set themselves to experiment in order to devise some means of laying the dust so prevalent on the roads in dry weather. In 1902 the Department of Seine and Marne began painting the surface of the roads with common tar, and so far as the test has gone it has been fairly successful. The work was continued last year, and this year we had the opportunity of seeing the work in progress on one of the roads near Melun.

The *modus operandi*, as we witnessed it, is that the weather must be fine and the roads perfectly dry. The surface sand is first swept clean off into the hard metal, the tar is heated in boilers at the roadside to a temperature of 60 deg., and with watering cans is poured regularly over the surface, and spread with a horsehair brush till the whole is properly covered. It is then allowed to set for twenty-four hours, when the sand formerly removed is sprinkled onto the tar and the traffic allowed to proceed over it. The thickness of the tar would be about ⅛ in. thick. The area covered per day by six men is 1,200 square metres, and 1 litre of tar covers 1,159 square metres for the first coat, at a cost of 12 cents per square metre. The cost of the tar was 50 francs per ton. The following is a quotation from M. Imb's report on the work done in 1902:—

"There has been no trace of dust on the tarred section throughout the whole summer of 1902, and no mud until the first thaw set in. At the present moment [in January] the first section has suffered seriously, the coating of tar has caked and it has been found necessary to scrape it, and by the end of winter the tarring will be no longer noticed further than that the road has a brownish color. Still it was found that the mud was much less on the tarred part than on the surrounding parts. It is also necessary to add that this section is situated on a route with a very heavy traffic, and very flat, so that it dried up badly, and in short the surface of the road was far from being regular. The other tarred sections have held out perfectly up to the summer of 1903, the time when the coating of tar is renewed, and during this interval nothing has been done in the way of cleaning off dust or scraping."

(*To be concluded in August*)



TAXATION OF TRAMWAYS*

An Important Question for Tramway Undertakings—Subject Complicated by Modern Conditions

By James Dalrymple

A VERY important question for tramway undertakings has arisen since the introduction of electric traction—viz., valuation and taxation. Last year we paid in local taxes the sum of £34,916 9s. 3d. This current year we have paid a very much larger sum. The following statement will show you how our valuation and the taxes have increased since 1894:—

Year.	Amount of Valuation.	Amount of Taxes Paid. Municipal Rates (Glasgow).	Municipal Rates (adjacent Burghs).	County Rates.	Poor and School Rates.	Sundries.	Total.
	£	£	£	£	£	£	£
1894-1895.....	18,000	1,044	216	26	1,133	66	2,485
1895-1896.....	20,571	1,260	259	39	1,401	106	3,065
1896-1897.....	55,301	2,757	491	90	3,893	253	7,484
1897-1898.....	68,319	2,121	635	208	4,662	307	8,933
1898-1899.....	55,686	2,764	527	43	3,541	232	7,107
1899-1900.....	74,437	3,687	607	194	5,127	256	9,871
1900-1901.....	99,084	5,219	666	95	7,166	349	13,495
1901-1902.....	83,438	6,929	805	202	7,012	250	15,298
1902-1903.....	90,486	6,936	824	787	7,640	479	16,666
1903-1904.....	228,350	12,762	1,583	3,302	16,554	715	34,916
1904-1905.....	245,464	13,562	1,715	4,241	18,052	746	38,316
1905-1906.....	260,964	.....	.....	.....	.....	...	.....

Tramways in Scotland are valued by the assessor of railways and canals, who is appointed by Government under the Lands Valuation Acts. All other subjects are, of course, valued by the local assessor. It is quite different in the case of tramways and railways in England, where each parish makes its own valuation for the portion of line within its own territory. In Scotland a railway company or a tramway undertaking, no matter through how many counties, burghs, or parishes the line may pass, has only to deal with one individual. This must result in a great saving of trouble and expense as compared with the English system.

From the above statement you will observe that the valuation for the last year of horse traction was £90,486, and for the first year of electric traction £228,350. For the second year of electric traction the figure had increased to £245,464, and for next year we will pay taxes on a valuation of £260,964.

It might be of interest to you to look for a moment at the method adopted to bring out the above valuation. In the case where you have a tenant paying an annual rent to a proprietor no question arises as to the valuation, as the rent is taken as the annual value of the subject. I think the only instance in Scotland where a tramway is leased to a company is the Edinburgh system. The Edinburgh Corporation own the tramway system and lease it to the Edinburgh and District Tramway Company, who pay a rent of something like 7 per cent. on the capital expenditure, which makes the rental about £90,000 per annum. The assessor simply takes this rental as the annual value of the undertaking for assessment. In the case of Glasgow, however, and the other corporations owning and working their own tramway systems, a tenant is assumed, and the question to be decided is what rental would the supposed tenant pay for the use of the rails, buildings, machinery, etc. The undernoted figures give you the details of how the valuation of the Glasgow system for the assessment year 1905-6 has been arrived at. The figures are based on the report for the year 1903-4.

VALUATION 1905-6

Abstract of accounts for year to May 31st, 1904, on which the valuation for 1905-6 is founded.

	£ s. d.	£ s. d.
Revenue	.....	722,724 0 0
Deduct:—		
Power expenses	20,293 0 0	
Traffic "	197,362 0 0	
General " (*less* £33,943 disallowed).	36,838 0 0	
Repairs (*less* £21,312 disallowed).....	47,072 0 0	
One-half permanent way and electric equipment renewal	48,048 0 0	
Depreciation of tenant's plant.....	31,075 0 0	
Occupier's income tax.....	2,517 0 0	
		383,202 0 0
Net revenue		339,522 0 0
Deduct:—Tenant's allowances:—		
12% for tenant's profits		
5 " interest		
6 " accidents, law charges, etc.		
23% on £316,328 being 75% of tenant's working stock and plant.....	72,755 0 0	
10% for interest and deterioration on £61,782, value of stores (excluding fixed plant spares, and permanent way stores)	6,178 0 0	
5% for interest on £5,000 for floating capital	250 0 0	
		79,183 0 0
		260,339 0 0
Add:—For extensions to be opened shortly.....		625 0 0
		£260,964 0 0

I mentioned that we paid last year local taxes amounting to £34,916, and this year the amount will exceed £38,300. These taxes include the Glasgow municipal rates and also the municipal rates in Burghs of Govan, Partick, Kinning Park, Rutherglen, Renfrew, Pollokshaws, Paisley, and Clydebank. They also include the county rates for Lanarkshire, Renfrewshire, and Dumbartonshire, and the parish

* In the course of a lecture delivered recently to the Glasgow Chartered Accountants Students' Society, the following interesting remarks were made by Mr. James Dalrymple, the general manager of the Glasgow Corporation Tramways, who is now in this country to advise Mayor Dunne as to the best methods for municipalizing the Chicago street railways.—[EDITOR.

rates for the parishes of Glasgow, Govan, Cathcart, Renfrew, Paisley, Eastwood, Cadder, Rutherglen, Cambuslang, and Old Kilpatrick.

In the burghs the local rates are levied on the gross valuation of the building, which is 5 per cent. on the original cost. The lines, however, are only assessed at one-fourth of their value. In the counties the rates are levied on the gross valuation of both buildings and lines. Of course, there are practically no buildings in the county areas, as our stations and depots are nearly all situated in the city. From the parish authorities we get, under the provisions of the Poor Law Act of 1845, an abatement to cover the owner's expenses in maintaining the subject, and for owner's taxes and insurance. Up till last year this abatement varied from 12½ to 35 per cent., the larger parishes allowing 20 per cent., this being also the rate of abatement given in the case of house property. We were, however, not satisfied with the abatement given, as we considered that the rate was insufficient for an electric tramway undertaking. The whole question was ultimately referred to arbitration. The arbiter decided that we were entitled to a deduction of 36 per cent. on the gross valuation, which meant an annual saving to the department of about £3,900.

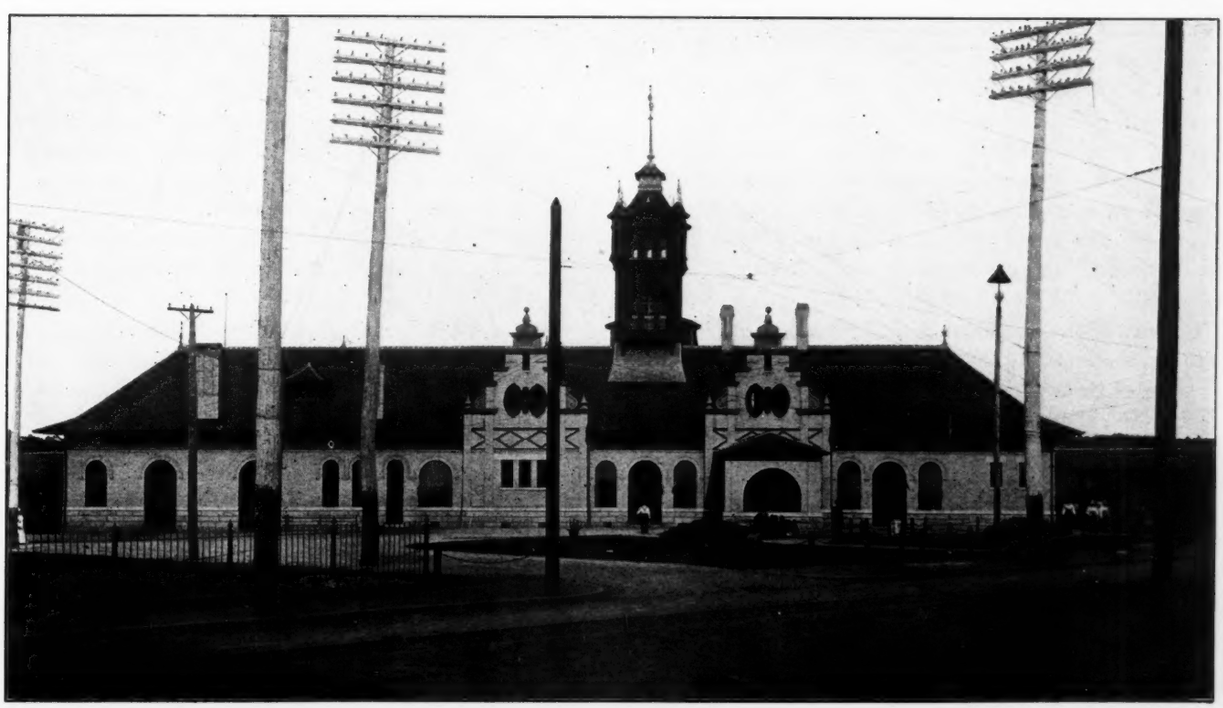
There is still the question of income tax on the profits. The assessment for income tax is made on the average profits for the three years immediately preceding the year of assessment. That is to say, the assessment for the year ending April, 1905, is made up by taking the average profits for the three years ending May, 1903. The method adopted in bringing out the profits is exceedingly simple, as will be seen from the following statement, which gives the assessment for the current year:

INCOME TAX.—YEAR OF ASSESSMENT, 1904-5

Year to May 31st, 1903.

	£	£	£	s.
Gross revenue	....	.....	656,572	0
Less rents on which tax interest has been paid ..	....	965		
" interest " " " "	....	263		
			1,228	0
			655,344	0
" working expenses	....	306,220		
Less Feu duties and teinds (tax deducted).	1,056			
" Municipal buildings over-charge.....	399			
" Parliamentary expenses	323			
" Property and income tax.....	1,519			
		3,297		
			302,923	0
Net profit for year, to May 31st, 1903.....	....	.....	352,421	0
" " " " " " " 1902.....	....	.....	326,057	0
" " " " " " " 1901.....	....	.....	87,699	0
Net profit for three years.....	....	.....	766,177	0
Average per year.....	....	.....	255,392	0
Deduct depreciation for year to May 31st, 1904....	....	.....	48,914	0
			206,478	0
		@ 1s. per £	£10,323	18

The practice in regard to depreciation is to take the figures for the year of assessment, not the average of the three years immediately preceding the year of assessment, as is done in bringing out the profits. You will notice that the average profits assessable for income tax for this year amounted to £255,392. After deducting the depreciation allowance the amount is reduced to £206,478. This sum at 1s. per £ of tax yields £10,324. It should be observed, however, that in paying our interest on borrowed capital we deducted income tax to the extent of £2,991. This sum we retained. The net amount, therefore, which falls to be charged to revenue for income tax is only £7,333.



UNION DEPOT, DANVILLE, VA.—SIDEWALKS, ETC., BUILT OF OLD DOMINION PORTLAND CEMENT, MADE BY VIRGINIA PORTLAND CEMENT COMPANY, CRAIGSVILLE, VA.

SEWAGE DISPOSAL

The Artificial and the Natural Theories—Disposal by Dilution—Irrigation and Intermittent Filtration

*By Morrell Vrooman, C. E.**

MORRELL VROOMAN

THE object of all sewage disposal is to remove the putrescible matter and disease germs from the sewage, or to change the organic matter of the sewage into harmless mineral forms, thus removing the bacteria by depriving them of their food.

There are two general theories: the artificial and the natural. Both accept the germ theory of disease, and are in unison as to the impurities and bacteria in sewage. One purifies by chemical action, and the other by the aid of bacteria. There are many applications of these two general theories.

CHEMICAL PRECIPITATION

One of the first extensively used methods in England was chemical precipitation. In this the sewage is thoroughly mixed with a certain amount of chemicals, usually lime and copperas—just before it is admitted to the tanks through which it flows slowly.

The lime and copperas chemically combined with certain of the solids of the sewage, forming an insoluble compound which settles to the bottom of the tanks, carrying other particles of suspended matter with it. This means 50 per cent. of the organic matter and bacteria are removed. The liquid is drawn off into some body of water or onto filters and the solids are usually removed from the tanks, pressed, and spread on land or used for filling.

In order to secure the best results by this method the sewage must be treated when fresh and the chemicals added to and thoroughly mixed before it enters the tanks. The tank space must not be less than 35 per cent. of the daily flow of sewage, and the tanks should be from five to eight feet deep.

The sewage may be applied to the tanks either intermittently or continuously, but the tanks must be so arranged that some of them may be cut out for the removal of sludge, and the sludge should be removed often enough to prevent putrefaction.

The sludge is usually from 90 to 95 per cent. water, and equal to about one and one-half tons per million gallons of sewage treated. The sludge may be disposed of as fertilizer, or run on land and plowed under, or mixed with combustibles and burned or carried out to sea and dumped in deep water.

The affluent contains organic matter and bacteria, and is not stable, soon beginning to decompose unless aerated or added to water containing large amounts of oxygen.

The cost of operating chemical plants is greater than other methods, varying from $3.00 to $12.00 per million gallons of sewage treated.

Chemical precipitation was hailed as a money making process because of the supposed fertilizing value of the sludge; hence numerous companies formed in England with the expectation of operating the plants at a profit. But because of the chemicals, the sludge is of little value as fertilizer. A few have been built in the United States. It is, perhaps, the least desirable of any of the methods for the purification of domestic sewage, and few plants are now building. Nevertheless, this method has considerable merit where manufacturing wastes are to be dealt with in combination with domestic sewage, combined with filtration a high degree of purification can be obtained.

DISPOSAL BY DILUTION

The common method of sewage disposal is by dilution or emptying the sewage into some body of water. This is the most economical and a fairly satisfactory method, provided the ratio of the flow of water to the flow of sewage is sufficiently large.

With the Ocean.—The disposal of sewage into the ocean is a satisfactory method if it is emptied by a sufficient number of outlets to insure uniform distribution through a large volume of water, and if the currents are in such direction as to carry the sewage from the land. It should usually be emptied at times of ebb tide, so that the solids will not be deposited on the banks. The coarser matter should be removed by a process of screening.

With Lake Waters.—The disposal by dilution with lake waters is similar with the ocean, and the sewage should be emptied at points where the currents will carry it away from land and in which the amount of dilution will be at a maximum.

With Running Streams.—The dilution with running streams is, perhaps, the common method. The amount of sewage that can be added to any running stream without causing objectionable pollution varies with the size and nature of the stream, the number of ponds, dams and falls on the stream, the rapidity and regularity of the flow, as well as the temperature.

Ordinarily it is considered that sewage may be added to a running stream when the flow of the sewage is from two and one-half to seven cubic feet per second for each one thousand people connected with the sewer. This proportion should be qualified, as the minimum seems to be too low for many streams.

Massachusetts Investigation.—The recent investigation by the Massachusetts State Board of Health of sewage disposal in running streams led to the conclusion that objectionable conditions are not likely to result from the addition

* City Engineer, Gloversville, N. Y. This is a digest of a paper read by Mr. Vrooman before the last meeting of the League of American Municipalities.

of sewage to running streams if the flow of the stream exceeds six cubic feet per second for each one thousand people connected with the sewer system, and it may not result in objectionable pollution where the flow is less than six cubic feet per second for each one thousand population. but is objectionable in all cases where the flow is less than three and one-half cubic feet per second for each one thousand population.

The above proportions are for domestic sewage, and assumes that the stream is ordinarily pure at the point at which the sewage is added; that the sewage will be thoroughly and uniformly mixed with the waters of the stream, and that the stream will flow a sufficient distance for the self-purifying process to be complete before more sewage is added, and that the low water flow of the stream will not be less than minimum; it also assumes that the natural self-purifying process will take place in the stream at all times sufficient to convert the organic matter to harmless mineral matter.

Before domestic sewage is added to any stream the condition of that stream shoud be known and the effect of the pollution at points below thoroughly investigated and understood, and no sewage should be put in a stream used as a public water supply unless the supply is thoroughly filtered.

Sewage Disposal by Irrigation or Sewage Farming

Sewage irrigation is one of the earlier methods of sewage purification employed, and is one which appeals to the general public because of the assumed value of sewage as a fertilizer. This method is only applicable where large areas of land are obtainable and where the mean temperature is not below 19-26 degrees Farenheit for any length of time, and can only be successfully operated where the annual rainfall is from 15-25 inches and irrigation plants are mainly desirable in localities where the water is needed for irrigation purposes.

In this method the sewage is spread over large areas of agricultural soil through surface ditches, or by other methods of distribution, the sewage from about one hundred persons being put on each acre of soil irrigated. It must be so distributed that the maximum growth of crops may be obtained with a proper degree of purification. This feature of sewage irrigation is the hard part of the actual management of a sewage farm. The amount of sewage is constant and the amount of water required by the crops varies with the amount of rainfall, the temperature and season of the year, as well as with the nature of the soil. Hence, at times, some of the sewage must be allowed to run off the land improperly purified, or applied to the land to the detriment of the crops. In order to completely purify the sewage on irrigation farms in this country the area must be much larger than is needed at ordinary times, or additional areas, which are thoroughly underdrained and on which no crops are raised and to which sewage can be added, should be constructed as supplementary.

A very high degree of purification can be obtained from a properly operated irrigation plant, but on account of the large amount of labor required it is an expensive system and cannot be operated at a profit.

Intermittent Filtration

Intermittent filtration consists of supplying large quantities of sewage at regular intervals on properly prepared areas of suitable porous soil. The land is laid out in level beds of about one acre in area, each sufficiently underdrained at a depth of, ordinarily, not less than five feet, to carry off the purified affluents. The sewage is uniformly distributed over the surface of the filters in amounts varying with the nature of the sewage, the soil, temperature, and the amount of purification required. The amount of sewage that can be applied to an acre of filters varies from about 80,000 to 200,000 gallons per day, allowing for periods of rest, or, in other words, the sewage from 1,000 to 1,500 can be applied on an acre of land by intermittent filtration without other preliminary treatment.

Intermittent filtration is the most practical and efficient method of disposal where the temperature does not average below 18 degrees F. for any considerable length of time. The filter beds consist of fine, clean, sand with the necessary pipes and valves to deliver and distribute the sewage on the surface and the underdrains to carry off the effluent. The raw sewage is applied and allowed to run off leaving a portion of the solids remaining in the form of a thin, dark scum on the surface of the beds, which soon dries in the action of the sun, and can be raked off without removing the surface sand, and it is of sufficient value as fertilizer to be easily disposed of.

The liquid matter and part of the solids settle through the sand partially filling the pores, and are acted upon by aerobic bacteria, which use the oxygen that is in the pores of the sand to reduce the organic matter to mineral form.

The surviving bacteria of the sewage remaining in the pores of the sand and the effluent, which is practically free from the bacteria and organic matter, may be emptied into any body of water.

Over 99 per cent. of the bacteria and from 90 to 98 per cent. of the organic matter is removed in this way. The process is physical, chemical and biological, and the presence of the bacteria is absolutely necessary to effective operation.

Intermittent filtration is concentrated action of the natural purifying process brought about by nitrifying bacteria in the presence of the oxygen in the filters. Anything that tends to destroy the life of the bacteria effects the efficiency of the filters.

The rapidity of the nitrification depends on the porosity of the soil and the necessary bacteria to produce the action are present in the surface soils and in the sewage.

The affluent from intermittent filters can be discharged into public water supplies with little or no danger of contamination, as is done in the vicinity of Boston.

Other Methods

There are several methods for the removal of sludge before the sewage is applied to the filters, the most important of these are *sedimentation* and *septic tanks.*

The sewage is allowed to remain in the sedimentation tanks a sufficient length of time to allow the heavier solids in suspension to settle to the bottom. The liquid matter is then drawn out on either irrigation fields or sand filter

beds, and the sludge, which has settled to the bottom, is run out on special sludge beds, where it is allowed to dry, and is removed by raking.

In the septic process the velocity of flow of the sewage through the tanks is so regulated that it requires from eight to twenty-four hours for the daily flow of sewage to pass through them.

Part of the solids settle mechanically to the bottom, and part of them rise to the surface, forming a thick scum, which at times is capable of supporting the weight of a man. The sewage in the septic tanks is acted upon by anerobic bacteria, which liquefy some of the solids and reduce the more complex compounds to simpler forms, generating a considerable volume of gases, which are equal to about 4 per cent. of the volume of the sewage passing through the tanks. These gases are mainly nitrogen, hydrogen, marsh gas and carbon dioxide, and are liberated in about the following proportions:

	Per cent.	Volume.
Carbon dioxide (CO)	0.3	0.6
Methane (CH)	20.3	24.4
Hydrogen (H)	18.2	36.4
Nitrogen (N)	61.2	38.6
	100.0	100.0

If sulphates are present in the sewage a certain amount of sulphuretted hydrogen will be produced.

The septic tanks remove about 50 per cent. of the solids. The amount of sludge remaining in the tanks is equal to about 1.5 to 5 cubic yards per million gallons of sewage. The effluent from the tanks contains but little, if any, oxygen and should be aerated, after which it may be further purified by filtration at much higher rates than it is possible with the raw sewage.

The sewage before entering either the sedimentation or septic tanks may be screened to remove the coarser matter.

The effluent from chemical precipitation, sedimentation or septic tanks can be applied to very coarse filters of crushed stone, coke or gravel called contact filters at exceedingly high rates and fairly good effluent produced, provided the filters are so arranged that they can be filled and the sewage allowed to remain in contact with the filtering material for a period of time, then drawn off and the filters allowed a period of rest for aeration, usually making about three complete cycles of operation in twenty-four hours.

There are many modifications of the above methods which may be used as well as other minor methods.

Manufacturing Wastes

Manufacturing wastes may or may not have a decided effect upon the method of sewage disposal depending upon whether the proportion of the volume of the manufacturing waste to the total volume of sewage be large or small. Usually the amount of solids in a given volume of manufacturing waste is greater than in the same valume of domestic sewage and by exercising a little care much of this can be removed by the manufacturers. If the manufacturing sewage is great in amount the manufacturers should be required to do all in their power to aid in the process of purification and the admission of manufacturing wastes to a disposal plant should be under strict rules and regulations and the control of the municipality owning the disposal plant.

Manufacturing wastes are ordinarily less dangerous to health in the stream and may act as precipitants of matter in the stream thus helping to clarify it. There are many waste products from manufacturing establishments that could be profitably made into bi-products. Some disposal plants for purely manufacturing wastes in England have repaid the cost of construction, maintenance and operation.

The mixing of domestic sewage with manufacturing wastes ordinarilly helps the process of purification of the manufacturing wastes by supplying the necessary bacteria.

Sludge

The most burdensome and difficult part of sewage purification is the final disposal of the sludge which is neither liquefied nor oxidized and which, in general, amounts to from about two to five cubic yards per million gallons of sewage and may be greatly increased over that amount by the addition of manufacturing wastes.

Sludge contains from 12,000,000 to 20,000,000 bacteria per cubic centimeter.

Cost

The cost of installation and of operation of disposal plants is subject to such wide variations on account of local conditions that it is impossible to give an approximate estimate for general application. The cost of preparation of irrigation fields, not including the cost of the land, is approximately from $250 to $500 per acre; the cost of preparation of intermittent sand filters, exclusive of land, where the natural soil is suited for the purpose, is from $1,500 to $2,500 per acre; where the natural soil is not suited for the purpose and sand of a proper grade has to be supplied it is from $5,000 to $8,000 per acre. The cost of construction of covered septic tanks from $6,000 to $10,000 per million gallons of sewage filtered per day. The cost of construction of chemical precipitation tank plants is about $30,000 per million gallons of sewage filtered per day. The cost of construction of contact beds is from $8,000 to $20,000 per acre. The cost of operation of the different methods varies from $3 to $12 per million gallons of sewage treated.

The system to be adopted depends on the climatic conditions, the amount and kind of area available, the amount and kind of sewage to be dealt with, the uniformity at strength of the sewage and the degree of purification necessary.

General

The adoption of systems of sewage and systems of water supply has resulted in the reduction of the death rates from four to forty-two per thousand of population, as illustrated by the following tables:

	Annual Average, 1858-68.	Date of Water-supply.	Annual Average, 1878-89.	Per cent. of Average.
Fall River	77.8	1874	62.3	81
Springfield	96.7	1875	52.9	55
Taunton	61.2	1876	50.2	82
Northampton	109.8	1871	40.4	37
Lynn	90.6	1871	38.7	43
New Bedford	77.7	1869	38.0	49
Newton	65.7	1876	36.5	56
Malden	80.4	1870	35.4	44
Fitchburg	105.0	1872	31.6	30
Woburn	82.9	1873	29.5	36
Somerville	42.8	1867	29.5	69
Chelsea	59.7	1867	28.9	48
Waltham	81.2	1873	24.2	30
Average	79.4		38.3	

The general construction of sewage purification plants

would probably result in a further reduction, as numerous streams of water to which sewage is added are used for public water supply.

If properly operated disposal plants are not objectionable, and obnoxious odors therefrom are not necessary, as has been amply demonstrated, although the natural inclination is to consider sewage disposal plants as very objectionable and unwholesome.

The decisions of the courts on stream pollution have been against municipalities and often a small amount of pollution is apt to be the cause for a permanent injunction prohibiting the continuance of the pollution.

No particular method nor general fundamental data on which to base plans can be given to a municipality until a thorough study has been made of the local conditions and of the amount and location of available area; the amount and regularity of the rainfall; the amount, kind, strength and regularity of the flow of sewage; the kind, size, uniformity, and porosity of the soil; the probable future growth of the municipality; the local value and method of disposal of sludge; manufacturing waste, the amount, nature, and chemical composition thereof and the practicability of having the manufacturers dispose of their own wastes either the whole, or in part; also the conditions effecting the cost of construction and operation of the systems.

The income from any sewage disposal plant, where the water is used on soil for irrigation purposes, is small, and much less than the cost of operation, and there is no good outlook for their future operation at a profit, therefore the present idea in planning a disposal system should be to obtain as effective a system with as little original investment as possible. Effective operation is the primary object.

SPECIAL ASSESSMENTS*

Municipal Limitations in Executing Statutory Law—Local Improvements Under Special Assessments in Illinois

By James F. O'Connor

JAMES F. O'CONNOR

IT is hardly necessary before an audience made up of municipal officers to call attention to the complexity of the subject of special assessments. The phases of this branch of municipal administration are so many and so varied that it would be impossible to go comprehensively into questions of local practice in the various portions of our country, or even adequately to set forth or illustrate the general laws upon which that practice rests. The most one can do, within the limits of our time, is to review some of the general characteristics of the subject and one or two of the basic principles underlying it, and briefly outline the process of making local improvements under special assessments in the State of Illinois.

The laws of special assessments are purely statutory and a municipal government must, in their administration, limit itself absolutely to such powers as are conferred upon the municipality by legislative enactments. A special assessment is defined by Seligman as, "A compulsory contribution paid once and for all to defray the cost of a specific improvement to property, undertaken in the public interest and levied by the government in proportion to the special benefits accruing to the property owner." In Cooley's great work on "Taxation" we find this definition: "A special assessment is a burden imposed by law upon real property for a public improvement; the extent of the burden being determined by the special benefits which inure to the assessed property by reason of the improvement."

The authority for making special assessments has been in different times by different authorities deduced from several of the attributes of sovereignty. In one of the earlier Illinois cases this authority is held to proceed from "eminent domain"; and even at the present time certain assessment proceedings, as for the construction of sidewalks and drains, find their justification under the police power of the State. In general, however, there is no doubt that while a special assessment is not a tax it is levied by a delegation of the sovereign power of taxation. It is in some views like—in others unlike—a tax. It is like in that it is levied by governmental authority, and that payment is compulsory. It is unlike in that it is not continuous, being a specific levy for a specific improvement, and in that the proceedings are in rem, never in personam. The judgment in a special assessment runs against the property only.

The great principle supporting special assessments in every community, in all jurisdictions, is that of special benefit. The safeguard on such assessments is, or should be, the doctrine that an assessment upon any parcel of land may not exceed the benefit accruing to that piece of property by reason of the improvement for the cost of which the assessment is spread. It can easily be seen that, unless this idea of special benefit is kept constantly in mind in the making of special assessments, the process may result in not a beneficial and desirable exercise of government, but an absolute confiscation of private property. And it is because this idea is sometimes neglected by municipal officers that local improvements, instead of originating upon the request and having the active support of the assessed property owners, are so often made by the municipaltiy only in the face of strenuous objections and prolonged legal contests by those who, under the theory of these assessments, should have value received for what they are called upon to pay.

At this point let me briefly outline the process of making

* A paper read at the last convention of the League of American Municipalities.—[EDITOR.

local improvements, under Illinois statutes, in cities of the first class.

A board of local improvements has been created. This board consists of five members, four of whom shall not be otherwise officially connected with the city government, and one of whom, the city's superintendent of special assessments, shall be ex-officio secretary of the board. A contemplated improvement may be proposed in one of several ways: (1) By petition of the owners of the property abutting on the proposed improvement; (2) By order of the city council upon a resolution presented by an alderman of the ward in which the improvement is to be made; (3) By order of the board of local improvements.

No matter by which of these methods the improvement is proposed, the real initiative is taken by the board in accordance with the law. That body, as the first step in the movement, orders its engineer to report upon the need and feasibility of the improvement. If the report is favorable, the board orders the engineer to prepare an estimate of the cost of the work. After receiving the estimate, steps are taken to have a public hearing of the owners or agents of the property which will be assessed by the improvement. Due notice, by mail, of the time and place of the hearing shall be given to those persons who paid the taxes on the property in the preceding year, and such notices shall be mailed not less than five days prior to the date set for the hearing. At this hearing any interested property owner shall be heard, whether in support of or in opposition to the improvement, and thereupon the board shall, by resolution, adhere to or abandon the same or change or modify its limits, character, or estimated cost. Any change which does not increase the estimated cost by 20 per cent. may be made without further hearing, but if the desired change would increase the cost by that or a greater percentage, a new estimate and a new hearing must be had as in the first instance, and even though the proposed improvement should be ordered by the board at the hearing, it is still within the power of affected property owners to stay all proceedings in the matter for one year, by filing within thirty days of the hearing a protest representing a majority of the frontage.

The next step is the preparation of an ordinance, its presentation to the city council and its passage by that body. This ordinance shall be recommended for passage by the board of local improvements, and the recommendation shall be signed by a majority of the board members. With this ordinance and recommendation the board shall also transmit to the council an estimate of the cost of the improvement, signed by the board's engineer. Upon passage of the ordinance the board files its petition in the county court praying that a special assessment be levied for the estimated cost of the improvement. After the filing of the petition, the superintendent of special assessments spreads or distributes the assessment upon the abutting or continuous property upon the basis of the engineer's estimate of the total cost, after setting aside such portion thereof as is judged proper to be paid by general taxation as "Public Benefits."

Notice is given every property owner named in the assessment roll of the filing of the petition, such notice stating the amount to be assessed against the property of the individual and that confirmation of such assessment will be asked by the municipality at a specific time, which shall be not less than fifteen days after the mailing of the notice. Usually a rule is entered to file objections by a certain day. If no objections are filed default confirmation is had, unless the court, of its own motion, reviews and amends the distribution of the assessment. Even where objections are filed confirmation is had upon the unobjecting portion. Hearing of objections proceeds without a jury excepting the hearing of objections on the ground that the property will not be benefited to the amount of the assessment.

Following confirmation of the assessment, the board of local improvements, within statutory time, proceeds to the actual construction of the improvement.

A formal contract is entered into between the successful bidder as one party and the municipality as the other. A bond of guarantee and indemnity to the satisfaction of the board is filed by the contractor and this, with detailed specifications of the work, is attached to the articles of agreement.

The last division of this process in which we are interested is that which looks to the collection of the assessment. Under former Illinois enactments, the assessment was confirmed, certified by the county court to the collector, and sometimes fully collected, before work was done or vouchers issued by the city in payment therefor. A later amendment provided for certification only after the completion of the work, when the court, upon the statement of the board, certified to the collector only so much of the confirmed assessment as was sufficient to meet the actual expense of making the improvement.

An important consideration in the levying of special assessments is that portion of the benefit which accrues to the community at large and which is—or should be—paid for by general taxation. Under the true theory of these assessments, the estimates of special benefits to the property and public benefits to the community should be strictly and impartially made in spreading the cost of the improvement. Exact fairness, it is admitted, can seldom be reached in a matter so difficult of calculation, but it is certain that in very many communities the abutting property is made to bear the burden of the entire cost of the improvement. One cannot defend the common practice of city officials in certifying on their assessment rolls that the proposed improvement will be of no benefit to the community at large.

An examination of municipal improvements under special assessments will frequently disclose the fact that the amounts assessed against a butting property is out of all proportion to the special and actual benefit thereto accruing, while the public benefits are either reduced to an insignificant proportion or boldly eliminated altogether from the levy. It is true that this practice has grown out of the lack of funds available in these particular municipalities; and assessing bodies are not always to be severely criticised if their anxiety to procure local improvements leads them to proceedings wherein the burden of cost is unjustly distributed. Yet it is not to be forgotten that the depleted condition of a municipal treasury is no excuse for confiscation by the municipality of private property, and for every dollar assessed on property in excess of special benefits to that property accruing there is, pro tanto, such confiscation.

To my mind a prolific source of trouble to many munici-

palities in the enforcement of special assessments arises from the preliminary estimate of the cost of the improvement, especially where, as in Illinois and other States, deficiency and supplemental assessments are so numerous. The engineer, whether misled by prices obtained under other and more favorable conditions, or anxious to secure for his city lower bids for the work, makes his estimate, if not plainly too low for the local prices of labor and material, at least just high enough to do the work under the most favorable conditions. The property owners make no protest and file no objections to this small or reasonable assessment. Thereupon confirmation is had and the municipality receives proposals. The lowest of these is higher than the assessment and is perhaps rejected, but after repeated advertisement—if not indeed in the first instance—it is discovered that the work cannot be done for the amount of the estimate, and thereupon the administrative body accepts a proposal, awards the contract, and orders a supplemental assessment spread upon the previously assessed property. Of this supplemental assessment the property owners have no notice, except upon the application for judgment of confirmation of the same, not being entitled, under a recent decision, to a public hearing on this proposition.

The result usually is that the objections to the supplemental assessment are more bitter than would have been the case in the original assessment had that been large enough to cover the cost of the work as finally contracted for, and the objecting property owner, smarting under a sense of deception and injustice (unwarranted, perhaps), loses confidence in the assessing body and is disposed to contest every future assessment, however reasonable or small

If officers of a municipal department having in charge local improvements, after making a liberal estimate and assessment cannot, by reason of their knowledge of local conditions and the prices of labor and material in the local market, and by the exercise of their discretionary power of rejecting bids, prevent extortionate prices for public work, the mere making of a low preliminary estimate will not tend to reduce the individual burden, where the practice of spreading slupplemental assessments is common.

Again, the same decision which held public hearings to be not necessary to the validity of supplemental assessments, sustains objections raised to a supplemental on the ground that the improvement has not been completed. This must create on the part of the contractor a wholesome uncertainty as to the collection of so much of his bid and contract as exceeds the amount of the original assessment. There is, however, nothing in this portion of the decision tending to decrease the volume of objections filed. The effect will probably be quite the contrary, and I am disposed to prefer even the old system of rebates, with all its complications, to anything which, by promoting legal contests, tends to produce defaults in collection and consequently to impair the municipal credit. We have had severe demonstration of the fact that the impairment of municipal credit is quickly effected, but once impaired its rehabilitation is the slow work of years; and so far as special assessments are concerned the property owners pay the price. As a factor in the increased cost of public improvements, no consideration is so potent as delay or default on the part of the municipality in collecting special assessment funds, or in paying therefrom its vouchers or bonds issued to contractors for local improvements. Neither combinations nor collusion will prove so effective, nor require so long a time to remedy the condition produced.

To sum up in a few words, the operations of municipalities in the application of special assessments require for their proper conduct these, among other principles: clearly defined legislative authority; strict but intelligent observance of the limits of that authority on the part of municipal officers; technical education and up-to-date-ness as to local conditions, laws, materials and community needs, on the part of engineers, bureau heads and others in charge of constructive work; fairness and frankness in dealing with the property owner; fairness and frankness, too, towards contractors; and lastly, constant and faithful effort in the collection and disbursement of funds to the end that special assessment bonds and vouchers issued by the municipality, in anticipation of collection, shall be worth in any market at least one hundred cents on the dollar.

STONE CRUSHERS AND BITULITHIC PAVING PLANT, ATLANTA, GA. OPERATED BY CONVICT LABOR

MUNICIPAL OPERATION OF A GAS PLANT

Experience with the Municipally-owned Gas Plant in Duluth—The Baleful Influence of Politicians Eliminated

By L. N. Case *

In writing on the municipal operation of the gas plant in Duluth, I do not wish to be understood as claiming that its success is due entirely to municipal ownership, nor, as a matter of fact, to this condition as much as it is to some other things.

The best that can be said for municipal ownership from my point of view, after many years' experience, is that it presents opportunities for obtaining reduced rates that the operation by a company does not.

Whether a plant is operated by a company or by a municipality the people, nay, the city itself, will consult their and its own interests in the patronage they bestow. Patriotism, or loyalty to the "people's enterprise," does not weigh to any apparent extent even with the people themselves.

It is said, and very truly, that "in touching a man's pocket you touch the controlling influence of his life." Possibly this explains why it frequently happens that a people will expend large sums in the construction or purchase of a plant and then deliberately go and patronize the other "feller," if they can, by so doing, obtain the services for a trifle less than they are being furnished by the city. This happens, of course, in communities where the public plant is opposed by a private company, which will invariably make a reduced, secret and discriminating rate in order to obtain the patronage of certain people then being furnished by the city. Then, when the municipal plant, through this and kindred influences, fails "to pay," they condemn the management or the principle and another illustration is offered that "municipal ownership is a failure."

The opportunities for obtaining reduced rates, which is only possible when the plant is operated beyond the influence or reach of polititcians, arise from the existence of the following facts:

First, that money can be borrowed for the construction of a plant on the city's credit 1 or 2 per cent. lower than the interest at which the bonds of a private company can be floated.

Second, no stock, requiring the plant to be operated at a profit, is issued.

Third, it is not continually being made the object of graft by rapacious politicians, creating in many cases considerable additional expense.

If a private company would say to a community: "Fellow citizens, we shall depend entirely for our success upon your good will, which we shall try to win by a careful and kindly service; by as low rates as we can afford; and by treating all persons alike, avoiding discriminations of every kind; and, further, we shall not pay out one solitary cent to buy political influence or favor, but will give to the people all that there is in it over and above a fair and reasonable profit on the money invested"—if a company could say this, it would meet, I fully believe with the same success that has been obtained here in Duluth, with the exception of the benefits derivable from two of the opportunities above noted.

On August 1, 1898, the city of Duluth purchased the water and light plants of a private company at a price considerably in excess of the actual value of the material properties thereof, thereby largely increasing the interest burden thereon.

In the month of October following its purchase I was employed as its manager and one month thereafter I recommended to the Board a reduction of the rates, simply as a business proposition; and notwithstanding the objection was raised that this meant a reduction in the income of the plant which was already inadequate, the recommendation was adopted.

The gas plant had been, previous to the purchase and for two years thereafter, operated at a loss and to this extent was a burden on the water plant.

So successful was this first reduction in increasing the output that this policy has prevailed ever since.

The rates were at first $1.90 net for lighting gas and $1.00 for fuel. Seven reductions in the rates have been made and we are now selling gas at 90 cents for light and 75 cents for fuel.

As an illustration of the statement that the gas plant was at first operated at a loss, and also of the effect on the net income which resulted from these reductions in the rates, I submit the following statement:

In the year 1899, the first full year the plant was operated by the city, the excess of expenditures, including interest, over receipts was $5,683.00.

In 1903 the excess of *receipts* over expenditures was $4,584.00 with gas for all purposes at $1.00.

In 1898, the year the city bought the plant, the quantity sold to consumers amounted to twenty million cubic feet. We are selling this year at the rate of ninety-five million cubic feet.

The following statements will give an illustration of the effect upon the cost of manufacturing and distributing gas that is caused by increasing the output of a plant.

In 1900, the first year's operations that I can give intact, the cost to the department for each 1,000 cubic feet manufactured, the total quantity being less than thirty-three million cubic feet, was in the different branches of the service as follows:

* Manager and Secretary Water and Light Commissioners, Duluth, Minn.

Manufacturing (including repairs at works)	47 cents
Distribution (including all other expenses)	24 cents
Interest on the plant	55 cents
Total	$1.26 cents

This year as before stated we are making, or rather selling, at the rate of ninety-five million cubic feet with expenses per 1,000 cubic feet as follows:

Manufacturing	47 cents
Distribution	14 cents
Interest	24 cents
Total	85 cents
A reduction in cost per 1,000 feet of	41 cents

Whatever slight reduction has been made in the cost by manufacturing larger quantities has been offset by the increased cost of labor and materials.

The loss of gas in distribution, usually designated as "unaccounted for," varies and depends very largely upon the care bestowed upon the construction of the system. This amounted last year to 12 per cent. which is unusually small, the maximum monthly loss being nearly 19 per cent.

There is one feature in the conditions in Duluth that assists materially in producing a comparatively low expenditure for operation and maintenance and that is, its being jointly operated with a water plant. This feature, however, prevailed with the company from which it was purchased. As an offset to this, it is handicapped by a much larger construction account than its necessities require, which results in an increased interest burden. It was the policy of the company and, also of the city, to extend gas mains wherever water mains are called for. The result is that we have miles of pipe upon which there is no consumer and from which we derive no revenue.

The benefits to the people from the six years' operation of the plant by the city may be summed up in this statement:

The plant is in better condition than when purchased and the saving to consumers effected by the reductions in the rates, including those of the present year, aggregates $140,000.

In closing I desire to say that, notwithstanding the apparent lack of co-operation on the part of the people themselves, it is far better for a community to own and operate its public plants because of the possibility of greatly improving the service and also of obtaining these public services at greatly reduced rates. For, after all, these results are a good thing for a people whether they appreciate them or not.

BITULITHIC PAVEMENT ON PIEDMONT AVENUE, ATLANTA, GA. BUILT BY CONVICT LABOR.—LOOKING SOUTH FROM TENTH STREET.

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Franchise Tax Law Upheld

WHEN the New York State Franchise Tax Law was enacted several years ago, through the personal effort of then Governor Roosevelt, it was pronounced by the large corporations of the state as unconstitutional, and the great public service corporations of New York City refused to pay the tax and immediately resorted to the courts. Governor Roosevelt was called all sorts of names for securing the enactment of such a law. Its ultimate defeat was commonly prophesied. On May 29th, this special Franchise Tax Law was held by the United States Supreme Court to be valid. This decision was unanimous.

In its decision the Court says the judgment of the Court of Appeals settled that there was nothing in the special franchise law to conflict with the Constitution of the State of New York and the corporations did not contend that there was any constitutional objection to the taxation of franchises, they conceding that there was a right to subject them to a share in the burden of supporting the government. The main contention was that the franchise tax legislation impaired the obligation of contracts.

It must be borne in mind that presumptively all property within the territorial limits of a State was subject to its taxing power, and whoever insisted that any peculiar property was not so subject had the burden of proof and must make it entirely clear that by contract or otherwise the property was beyond its reach. Quoting from numerous decisions of the court on that point, Justice Brewer says the rule laid down thereby was akin to, if not part of, the broad proposition, now universally accepted, that in grants from the public nothing passed by implication.

Applying those well established rules to the several contracts under consideration it would be perceived that there was no express relinquishment of the right of taxation. The plaintiffs in error must rely upon some implication and not upon any direct stipulation. In each contract there was a grant of privileges, but the grant was specifically of privileges in respect to the construction, operation and maintenance of a street railroad. These were all that in terms were granted. In consideration of this grant the grantees were to pay something, and such payment was nowhere said to be in lieu of or as an equivalent or substitute for taxes.

All that could be extracted from the language used was a grant of privilege and payment therefor. Other words must be written into the contract before there could be found any relinquishment of the power of taxation. It would not be doubted that if a grant was of specific, tangible property, like a tract of land, and the payment therefor was a gross sum, no implication of an exemption from taxation would arise. Nor would this result be altered by the fact that the payment for the thing granted was to be made annually, instead of by a single sum in gross. If it was the real estate it would be equivalent to the conveyance of the tract subject to ground rent, and the grantee taking the title would hold it liable to taxation upon its value. If this be true in reference to a grant of tangible property it was equally true in respect to a grant of a franchise, for a franchise, though tangible, was none the less property, and oftentimes property of great value.

To the claim that when the public granted a privilege on condition of the payment of an annual sum the contract implied that the public should exact no larger amount for that privilege, and that to impose a tax was simply increasing the price which the grantee was called upon to pay for the privileges, the opinion quotes extensively from decisions by the Supreme Court to the contrary.

Taking up the contentions that the franchise tax was not imposed for many years after the franchises were granted; that Govs. Cleveland and Roosevelt in their messages had both referred to the taxes as 'taxes,' and that section 46 of the franchise law provided for the deduction of other taxes, the court says it would be giving them undue significance to hold that they are potent to discharge the power of a State to subject to the burdens of taxation property within its limits.

The word "tax," says the opinion, is not infrequently used in a general sense as denoting a burden or charge, and not in the strict legal sense of the charge or burden imposed by the State for the purposes of revenue for its support. Undoubtedly the payment for the franchise of an annual sum was a burden, and in that sense it might not unnaturally have been spoken of as a tax. Being recognized as a burden it may also well be that when the tax was of comparatively little value the Legislature did not see fit to subject it to the burdens of ordinary taxation. But the omission of one Legislature or a dozen Legislatures does not destroy the power of the State.

Section 46 of the franchise tax act indicated the desire of the Legislature to deal equitably with the corporations holding those franchises. Surely the manifestation of this desire could not be constructed into a repudiation of power. The annual charges were not called taxes but were spoken of as in the nature of a tax, and the Legislature, recognizing

the equitable force of the claim based thereon, provided that the corporation be given credit for sums thus payable.

"We are of the opinion," says Justice Brewer, "that no contract right of the relator was impaired by the legislation in question."

In referring to the contentions of the corporations that the franchise tax law operated to deprive them of the equal protection of the laws and the due process thereof, in that it added to the obligations of their various contracts while preserving all the burdens previously imposed, and that it discriminated against them and in favor of their competitors operating under the surface of many of the same streets they occupied, the court says it having already been decided that there was impairment of contract the fact that the companies had escaped the burden for these many years was their good fortune, but it in no manner discharged them from the ordinary burdens of taxation which the present law imposed.

The lump sum under which the taxes were paid was so obviously a payment for the franchise that it could not be considered in any just sense as possessing the nature of a tax. It was not even rental. It was like money paid for a tract of land, part of the purchase price. The reductions allowed for other taxes were a matter of grace on the part of the Legislature, but that did not entitle every holder of a franchise to a like reduction. It was akin to an exemption, and there was nothing in the Federal Constitution to prevent a State from granting exemptions from taxation.

As to the discrimination in favor of the subway, the court says there was a difference between the two sufficient to justify a diversity in the mode and extent of taxation. Quoting from the court's decision in the Savannah street railway suit, present term, in which it held that street and steam railways occupying the streets of that city could be subjected to different modes of taxation, the court adds that the condition of the title to the only subsurface road in the city of New York clearly put it in a class by itself.

Wanted: Light on New York's Educational Problem

WILL the President of the United States ever travel a half day to attend a national gathering of municipal officers? Why is it that we expect him to enjoy the National Educational Association which meets at Asbury Park next week, but to have "reasons of state" for not attending the League of American Municipalities? A similar question is suggested by the fact the Mayor McClellan chooses this audience of thousands of teachers for his first public address on the need for proper and intelligible standards of local administration. Regretting as we do that municipal officers do not attend their national conventions in sufficiently large numbers, we are grateful to the educators for setting such a praiseworthy pace. Moreover, we look forward confidently to the time when the L. A. M. will be regarded as second to none in possibilities and achievements among the scores of national organizations.

It is most fitting that Mayor McClellan should testify thus publically to his desire for re-organization of city departments along modern business lines. Without an equal, it is said, among the mayors of New York in his personal knowledge of the details of government, even he has found it impossible to ascertain the fundamental weaknesses in time to prevent scandal. Important tendencies that might easily be corrected if discovered early do not come to his attention until the ulcerating stage is reached. Realizing the futility of attempting to administer public funds either efficiently or honestly without knowledge of results obtained; and realizing further the impossibility of measuring results by promises and surmises, he has named a Commission of Fifteen to report on methods of raising taxes and describing the results obtained by disbursing them, so that he and other responsible officers may tell promptly and accurately whether the taxpayers' money goes as far as it ought and in the right direction.

Nor will he need to go outside the experience of school teachers for illustration, not even outside his own experience with teachers. Ever since he took office he has been misunderstood by teachers and others who have resented the disciplining of New York's educators. This, notwithstanding his earnest efforts to secure a seat for every pupil and to strengthen the school system as a whole. Perhaps it was to have been expected that teachers would fail to understand men who declared that teachers were extravagant in their use of public funds and pupils' time. Few officers smile serenely when their budget is out even 5 per cent.—how much worse it seems when 5 per cent. means one million dollars! It is fortunate, therefore, for the mayor and for the nation's teachers that he is to have the opportunity while their guest, to tell them just what he has had in mind in urging economical and "standardized" administration of the school budget.

He has a great advantage in that the refusal of the Board of Estimate to vote school money in the absence of proof that it was needed and in face of proof that economy was practicable has led to economies running into hundreds of thousands and to significant changes in the course of study. In other words he starts with universal admission that the quest for a standard has already caused changes of policy which will divert millions of hours of time and millions of dollars from the inexperient to the indispensable. Furthermore he can point to a Special Committee of Five named by the Board of Education to report methods which shall make impossible in future such conditions as the following enumerated by the current School Review: "350,000 school children out of grade, undiscovered until recently; only 61% of high school pupils attending regularly; curtailment of night schools, vacation schools, recreation centers and popular lectures; some teachers having 13 pupils others having 50; pupils in recreation centers varying from 70 to 220 per teacher; demoralizing concessions of bitter personal controversies over school policy; a flood of specious arguments for and against essential principles of pedagogics; accepting strategies rather than facts as our guide; studying the public pulse instead of the public school; attempting to enforce the compulsory education law without a school census; relying upon calamity and opportunism instead of records to determine new policies."

If the mayor can explain clearly to the educators from every section of the country how these defects can be easily and permanently remedied, his address will become a classic not only for schools but for every other branch of municipal service.

The Foolish Opposition to Patented Articles

The city of New York is far from being a leader in the best municipal practice. Through the over-zealous work of would-be reformers, the city has had fastened upon it from time to time, what may justly be called stupid charter provisions. It must be admitted, however, that the intent was all right, but the result is not only bad but far from being what the reformers really desired. For example, the charter provision which prevents the use of patented articles is not only wrong in principle but exceedingly bad in practice.

In Brooklyn recently a contractor was prevented from using a patented steel lined concrete curb. As is well known among the contractors and other municipalities, this is one of the best curbings ever manufactured. It is more desirable than the blue stone or sand stone curbing that is hewn out of rock, and presents a much better appearance. It has been and is being used in many municipalities throughout the country, with perfect satisfaction, and the only reason it cannot be used in Greater New York is that it happens to be patented. It is no more expensive, and judging from a standpoint of quality, is a much better article than can be had for the same money in stone.

In a similar manner the city is prevented from using one of the best pavements ever laid in the United States. For three years the manufacturers of this pavement have been endeavoring to secure a contract from the city of New York. The Corporation Council of the Low administration, declared that under certain conditions it would be perfectly proper to use it, even though it were a patented article, but an injunction restraining the city officials from awarding a contract for the pavement was secured by The Barber Asphalt Company, which, upon appeal, was made permanent, and prevented the use of this pavement. If there had been no charter provision prohibiting the use of patented articles, there would have been no chance for the trust to prevent the city from using this form of pavement. It is up to the officials of New York to "get out of the woods" and secure an improvement to the charter which will permit the use of any patented article, not only of steel lined concrete curbing and new kinds of pavement that may be patented, but also to take advantage of anything else which may be patented and of the best quality.

The Awakening of Philadelphia

Last month The Municipal Journal reviewed the situation in the Quaker City, under the caption of "Philadelphia in Disgrace." It gave a full description of how Mayor Weaver, backed by an aroused citizenship, overcame the combined attack of the United Gas Improvement Company and the political ring long in control of the city, to steal a franchise valued at many millions of dollars.

Since that day, Mayor Weaver, together with the reform element in Philadelphia, has continued to stand for an honest and sane administration of the city's affairs. Guided by the wise counsel of former Secretary of War Root, and of an advisory committee, Mr. Weaver has started investigations and asked for resignations of former officials, which thus far have yielded astonishing results and bid fair to make still greater revelations of the corruption which has held sway in Philadelphia for these many years.

Many useless employees have been dismissed and others will follow in their wake as soon as they may be found. The political gang, which has so long ruled, has been routed, and what will be more far reaching in its good effect upon the future government of the city, provided the present attitude of the mayor and his advisers is maintained, is the fact that the public service corporations, headed by the Gas Company and the transportation lines, are thoroughly scared. They are now in a position where they must fight to retain their ill-gotten gains, rather than scheme to obtain greater concessions from the city.

One of the most important steps thus far taken by Mayor Weaver, is the recent appointment of a commission, consisting of two expert accountants—Mr. Edward G. Perine, and Mr. A. L. Tinsley—and an engineer—Mr. William Barclay Parsons—all of New York. The expert accountants will scrutinize every letter, record and contract on file and will examine thoroughly all the books in connection with the installation of the filtration plant. When the accountants' work is well advanced, Mr. Parsons, with a corps of expert assistants, will take up the contracts in detail and make a minute examination of all the public work done. The result will be a comprehensive report, showing how the millions have been spent, how it has been squandered or stolen, wherein the filtration plant has been improperly constructed, and wherever lax or corrupt methods have been used in any department.

Prior to the appointment of this commission, Mr. John W. Hill, former Chief Engineer of the Filtration Bureau, and his son, who was acting as his first assistant, tendered their resignations at the request of the mayor. Mr. Hill, as Chief of the Bureau, is now awaiting trial on charges of forgery and falsifying records in the interest of some of the contractors. It is generally believed, however, that Mr. Hill will be able to clear himself from these charges, and it is only fair to suggest that popular judgment should be suspended until he has had a chance to refute the charges made.

Mayor Weaver has the opportunity of his life and is making good use of it. He should be commended in the highest terms for the high sense of public responsibility he has manifested in this aggressive warfare on the corrupt forces which have so long ruled in the Quaker City. While much has already been accomplished, it is sincerely hoped that he will look upon it as simply a good work just begun. Careful investigation should be made in every department of city government, and if, following such investigations, both he and those who co-operate with him bear in mind that, "eternal vigilance is the price of liberty," it will not be long before Philadelphia will be entitled to take its place among the clean cities of the world.

New York's Water Commission

In the selection of the members for the water commission, which is to solve the problem of obtaining a large water supply for the city, Mayor McClellan has received unstinted praise at the hands of the press. The commission consists of Mr. J. Edward Simmons, president of the Fourth National Bank of New York City, representing the Chamber of Commerce; Mr. Charles A. Shaw, president of the Han-

over Fire Insurance Co., representing the Board of Fire Underwriters; Mr. Charles N. Chadwick, president of the Charles N. Chadwick Manufacturing Company of Brooklyn, representing the Manufacturers' Association of Brooklyn.

When the mayor sent to Albany a bill providing for the commission, he announced that he would appoint men to be suggested by the three organizations named. The salary of the members of the commission will be $12,000 a year each and they cannot be removed from office, except on conviction of charges of neglect of duty or incompetence. The Commission will have general supervision of the carrying out of the plans for increasing the city's water supply and will have the power to condemn property, to select new water sheds, except in the prohibitive counties of Suffolk, Putnam and Dutchess, and to carry out the work committed to them, will have the spending of $90,000,000.

The duties of the Commission will be so important and exacting that it had been generally understood that the men appointed would be required to give their whole time to it. It was, therefore, with some surprise that the announcement made by the Mayor was received, in that he had selected men who are identified with interests which they cannot give up for the salary received without pecuniary sacrifice; at least this is true in cases of two of the gentlemen selected, while the third is only enabled to do it because he has practically retired from active work in his concern.

With commendable expedition, the new Commission has organized and made itself ready for business, with Mr. Simmons as chairman and Mr. Chadwick as secretary. An appropriation of $100,000 has been asked for to enable the commission to commence operations at once. The Act gives the Commission power to select its engineers, office staff, and to fix the salaries of its employees. Now that the preliminary steps have been taken toward the provision for a future water supply for New York City, it is expected and earnestly hoped that the Commission will move with all the aggressiveness which is consistent with thorough work.

Dalrymple on Municipal Ownership

THE newspapers of the country, egged on by the public service corporations, are claiming more comfort from the recent assertion of Mr. James Dalrymple, of Glasgow, who was sent to Chicago to advise Mayor Dunne about the installation of municipal railways in that city, than the situation will warrant. Most of the newspaper editors have given the impression that because of the opinion of Mr. Dalrymple, everything in the way of municipal ownership and operation in this country, has not only been a failure, but for all time to come will be a failure, if attempted.

To any well-informed citizen of the United States, this cannot but appear absurd, for the simple reason that there are hundreds of municipal plants in the United States, including water, electric light and gas, which are managed as economically as are the municipal tramways in Glasgow. To express any other view is a simple evidence of either one of two things: First, ignorance; or, second, that it is an opinion paid for or instigated by the owners of private corporations.

The foregoing is simply based upon the general press reports that appeared throughout the country upon Mr. Dalrymple's departure from Chicago, when, as a matter of fact, words were put into Mr. Dalrymple's mouth that he never uttered.

To a representative of THE MUNICIPAL JOURNAL, he made this general denial of these false reports, circulated by private corporations and others opposed to municipal ownership and operation: "I desire to deny that I ever said that the political machines of American cities were strong enough, with their control of the policemen and firemen, and that they would be simply impregnable if the street railways were taken over. I have made no criticisms of America or of American politics.

"I came to America at the request of Mayor Dunne of Chicago. He asked me to give him as clear an impression of the situation in Glasgow as I possibly could. He wished to know how the workers were appointed, how they were discharged, and how the lines were operated. I told him everything I knew, and put the facts before him as clearly as possible.

"Touching the question of politics, this much I will say, that they are at all times a peril in city ownership. The two must be kept separate, or no successful results can be achieved. I do not know the politics of two members of the Glasgow Board of Aldermen. They are constantly sending to me, of course, men to be employed in the tramway service and with the hope of obtaining places for them, but political backing does not secure preference in the selection of employees. As a matter of fact, I have generally noticed that the applicant who has political backing is usually least capable."

Just as THE MUNICIPAL JOURNAL believed, when the press reports first appeared to the effect that Mr. Dalrymple had asserted that public ownership and operation could never succeed in American cities because of the expense of political machines, he has emphatically denied making any such assertion. In the general conversation about the whole subject, it was evident that political machinery had much less control of public service corporations in Glasgow than in any American city, but even granting so much, Mr. Dalrymple expressed the conviction that taking all things into consideration, the American people would receive far greater benefits, if their street railways and other public service corporations were owned and operated by municipalities. For example, he was firm in his belief that the transportation companies of New York City had a fat thing; that to charge a five-cent fare, considering the crowded condition of the cars during many hours of the day, was little short of highway robbery. He expressed astonishment at the apparent forebearance and humility on the part of all classes of citizens in the great cities of America, which permitted these corporations to accumulate millions at the expense of the people.

The readers of THE MUNICIPAL JOURNAL will be glad to have the false impressions, created by a subsidized press throughout the country, corrected. Mr. Dalrymple does not believe that the corporation should rule in the public service field, but on the contrary emphatically expressed strongest belief in the ownership and operation of public service corporations by municipalities.

An Effort for Continuous Highways

THE Springfied (Mass.) Automobile Club, at one of its recent meetings, took action looking toward the establishment of continuous trunk highways out of the city of Springfield in all directions. This important step was taken after listening to an address by Col. William L. Dickinson, the well known good roads expert, who is secretary of the American Road Makers and vice-president of the New York and Chicago Road Association.

This action called attention to one of the most important phases of the development of good roads in the United States, namely, the aim of securing continuous improved highways between the leading commercial centers in every state, which necessarily would involve interstate connection. Next in importance to the organization and maintenance of a state highway department, comes this movement for the general betterment of the nation's highways. It should receive the earnest, aggresive and loyal support of every good roads man in the country, but especially that of the owner of an automobile and the various automobile clubs, including the national, state and local associations.

Up to the present time there has been no union of effort on the part of the various automobile associations; on the contrary each association has insisted upon conducting its campaign for good roads according to its own ideas, thus calling for as many independent organizations among this class of good roads advocates as there are associations. The mere mention of this fact should be a convincing argument for a combination of these numerous forces. If such a combination were effected and under the control of an executive committee, whose personnel should include a representative of every national and state automobile association, time, energy and money would be saved at the outset and a more rapid progress in the development of continuous improved highways would be the first result.

The formation of such a federation of automobile associations would require as its directing head, not a man alone conversant with the manufacture, trade and use of the automobile, but one who was thoroughly familiar with the good roads situation throughout the country and who himself was a good roads expert. Such men are rare, and Col. Dickinson is the only man known to THE MUNICIPAL JOURNAL who would be available for such a position. It is with the knowledge of his ability, without having communicated with him in regard to the matter, that THE MUNICIPAL JOURNAL would most urgently suggest: First, the formation of a federation of automobile associations; second, the securing of Col. Dickinson's services at once, upon such a basis as would enable him to devote his entire time to the promotion of this work.

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Government Reform in Rhode Island

Civic, state and national reform seems to be the order of the day everywhere. Rhode Island, the smallest State in the Union, is planning a vigorous campaign. To further the efforts of the reform element, a new weekly newspaper has been started, called "The State," which will devote its entire attention to the cause of popular government. In its salutatory it says:

"For years Rhode Island has needed a public newspaper which would strive to tell the truth, would not suppress facts, would give honest men and honorable causes a fair hearing, would cherish breadth of view and breadth of sympathy, and would even venture to have ideals.

"The prime object of "The State" will be to secure to the people of Rhode Island, in State and local affairs, the great right of self-government in its fullest measure, and along with that right the material and moral blessings which flow from it.

"This involves as its foundation a just and equal representation of the people in the General Assembly, which at present is the most unrepresentative body in America.

"It involves the principle of public ownership of public utilities, not only that they may be administered for the good of the people instead of for private gain, but because, in the form of private monopolies they have become an *imperium in imperio,* rivaling the State in power and seeking to dominate it."

THE MUNICIPAL JOURNAL gives a cordial greeting to "The State," and wishes for it abundant success in the work it has undertaken, and there is little doubt that if it adheres with a single purpose to its high resolve, the desired end will be attained.

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PUBLICITY BUREAU TO PROMOTE USE OF PAVING BRICK.—Following a suggestion of the editor of THE MUNICIPAL JOURNAL, a number of the leading brick manufacturers in the Middle West recently completed the organization of the National Association of Paving Brick Manufacturers. Its chief object is to conduct a campaign of education for the purpose of permitting the sale of paving brick by showing people the fine streets which can be made. The membership of this new association is practically limited to the states of Indiana, Ohio and Illinois, where most of the paving brick used in the United States are manufactured. There will be no effort made to control prices. All that is desired is to let the people know throughout the country the value of paving brick as a material for the construction of pavements. The officers of the association are: Will P. Blair, president, of Terre Haute, Ind.; W. S. Purrington, vice-president, Galesburg, Ill.; Charles N. Crook, treasurer, Youngstown, O.; Spencer M. Duty, secretary, Cleveland, O. THE MUNICIPAL JOURNAL expresses the earnest hope that the new association will meet with abundant success.

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PURITY OF MUNICIPAL ADMINISTRATION.—In the construction and care of streets in English cities, there is much which American municipalities can learn. This does not mean that municipal engineers in America have less ability than those in England, but rather that the system of municipal government on the other side of the Atlantic presents better opportunities under which the municipal engineer does his work. For example, in British cities the municipal engineer is not hampered by political "ward heelers" or machine rule, but is permitted to do his work unmolested and without dictation, so that the affairs of his department are conducted according to his best judgment. If such were the condition of affairs in American cities, better pavements, more beautiful parks, a larger number of public baths and playgrounds, and in fact a better administration

of all departments would be the immediate result. As it is the taxpayer is obliged to pay larger sums year by year upon his taxable property, because he shirks his duty as a citizen and permits gang rule to reign supreme. American cities need a few more mayors like John Weaver of Philadelphia, and officials such as President Roosevelt and Governor Folk of Missouri. The fact that there are a few such city officials—and the ones mentioned are not the only ones—encourages the hope that better things are in store for American municipalities.

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MUNICIPAL ELECTRICIANS CHANGE DATE OF MEETING.—Owing to the conflict of dates with other societies, it has been deemed best to alter the dates of the Erie Convention of the International Association of Municipal Electricians, to the 23rd, 24th and 25th of August. Secretary Frank P. Foster writes to THE MUNICIPAL JOURNAL as follows: "Every sign points to one of the most successful conventions we have ever had. The location of the city of Erie is a delightful one and at the time selected for our meeting the temperature will be found cool and comfortable. There are under way many plans for our entertainment, including some which differ from any we have ever had."

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A GOOD FINANCIAL POLICY.—In his inaugural address, Mayor George B. Ward, of Birmingham, Ala., recently expressed most emphatic views in regard to the public credit. He declared that during his administration, funds would be "systematically and sacredly set aside out of current receipts to pay every dollar of interest on our bonded indebtedness, and no matter what may happen to other departments dependent upon our treasury, the city's bond interest shall never at any time be placed in jeopardy." This is a good resolution for any mayor at the beginning of his administration, and if all chief executives of our municipalities would live up to such a policy, as Mayor Ward is sure to do, it would insure better things for city governments throughout the country.

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THE ASPHALT TRUST SUSTAINED BY THE GOVERNMENT.—In the June issue THE MUNICIPAL JOURNAL gave a résumé of the Venezuelan dispute under the caption of "The Asphalt Scandal." Reference was also made to its entanglement with the State Department involving the diplomatic service, Minister Bowen, First Assistant Secretary of State Loomis, who was Mr. Bowen's predecessor at Caracas. Since the issuance of the June number, Secretary Taft has, at the request of President Roosevelt, made a thorough investigation and submitted his report, with recommendations, to the President. As a result, Mr. Bowen has been dismissed from the diplomatic service by the President with sharp censure, while Secretary Loomis escaped with a mild reprimand, and is not only retained in office but appointed as a special ambassador to the government of France to receive the remains of John Paul Jones and return with them to America. Even the greatest of men make mistakes and to those who are conversant with the asphalt scandal in connection with the United States and Venezuela, this decision of President Roosevelt will appear unjust to former Minister Bowen, and as a serious blunder in retaining in the State Department a man whom the evidence submitted proved to be more than indiscreet. The least that the President could have done, in justice to the whole situation, was to have summarily dismissed both men, but if one were to be retained it is only too evident to those who have knowledge of the facts that the wrong man was retained in the service. It raises suspicion that the government has been unduly influenced by a powerful corporation, whose methods have been corrupt to the last degree. This decision cannot fail to strengthen the position of the trust and work to the detriment of all American municipalities, and, for this reason, is to be greatly regretted.

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Dangers from Heat Radiation

Brooklyn, N. Y., May 31, 1905

Editor, MUNICIPAL JOURNAL AND ENGINEER:

I had supposed that the comments of Mr. John R. Freeman at the National Board of Fire Underwriters' banquet a year ago, on the protection of window openings against the attack of fire, would be merged in the flood of criticism and speculation which followed in the wake of the Baltimore conflagration. The reprinting of his speech in your recent issues, however, has caused a recrudescence of interest in so many quarters, that it would seem advisable to call attention to a few of Mr. Freeman's statements which appear open to debate.

The matter of heat radiation has perhaps been subjected to more misapplied information and applied misinformation than any other concerning the fire loss. As affecting the ignition of goods within a building from an external fire—in other words, window protection—it has two phases: the heat radiated through the window covering, and the heat radiated from the cover itself upon being heated.

Notwithstanding Mr. Freeman's conclusive evidence of the burning ties and the rapidly traveling railroad passenger it is highly improbable that fire was ever started by radiation of heat *through* a glass window, so long as the glass remained intact. Mr. Freeman appears a bit hazy on the general subject of diathermancy for the early experiments of Melloni, and the more recent ones of Provostaye and Desains show quite clearly that glass is an excellent insulator of radiant heat cutting off an average of 83 per cent., while the diathermancy of distilled water is very low, cutting off 89 per cent., this in bodies one-third of an inch thick. It may be readily objected that such refinements are out of place in the broad field of fire protection. So are engineering generalizations based on such flimsy evidence as furnished by the railroad passenger of venerable memory, for there are few more notorious liars than the sensory nerves as indicators of comparative intensities.

The serious phase of the radiation hazard then is not heat coming *through* the window covering, but heat coming *from* the window covering. This is a very different matter and of course the tin-clad shutter is out of the discussion, for if in good repair and closed the tin-clad shutter is an unequaled fire stop for window openings.

There is probably little to choose between wire glass windows and iron shutters, whether placed inside or outside the glass, so far as the likelihood of radiating heat is concerned. Personally, I think this likelihood is largely over-

estimated by underwriters generally. I do not know of a single instance where "a stock of dry goods, or wooden ware, or baled cotton, or hemp," has been set on fire in actual practice by heat radiated from a wire glass window. I have seen many tests made along these lines, but the results have been confusing if not actually contradictory.

The whole problem of window protection resolves itself into a compromise between what the underwriter wants and what the owner will install. Tin-clad shutters without, and steel shutters, on the Freeman plan, within, would probably eliminate the exposure hazard—if they were in good repair and kept closed. Wire glass windows and outside sprinklers to keep the glass cool would do the same thing, beside having the advantages of freedom from deterioration and of always being ready. If fire underwriters really desire to secure window protection, it would seem more profitable to advocate wire glass windows which are always admissible and always at their best, than to cry for shutters which are architecturally out of the question in a large percentage of cases and are open much of the time where they are installed.

HARRY D. GUE.

Mr. Freeman's Reply

Providence, R. I., June 13, 1905

Editor, MUNICIPAL JOURNAL AND ENGINEER:

Mr. Gue is correct as to the diathermancy of water, and it was with knowledge that the research of physicists had shown only 11 per cent. of the heat rays pass through a thin continuous sheet of water, that I have made my various criticisms and expressions of doubt about the efficacy of "water curtains" and window sprinklers.

Owing to an inadvertency, for which I am alone at fault, a sentence was omitted from the printed report of my remarks before the National Board on this subject, and the sentence on diathermancy of water and glass, as it stands, did not convey my full meaning.

The greatest trouble with the "water curtain" comes from its lack of continuity; in practice, these "curtains" contain so many holes, that many spots must exist through which nearly the whole of the heat rays can penetrate.

As to the diathermancy of glass, I will not now question that a large percentage of heat rays may be cut off by it. Nevertheless, there is abundant practical experience to demonstrate that those which penetrate may become dangerous.

You will note that in this address I was strongly advocating that this subject of the transmission of radiant heat through wire glass and through "water curtains" should be thoroughly studied, scientifically and by practical tests, like those which the underwriters' laboratory in Chicago has facilities for making.

I had indeed previously been informed of preliminary tests on wire glass that had shown sufficient heat could pass through it to ignite combustible material on the farther side, although there was a considerable air space between the glass and this material.

The whole purpose of this part of my address was to urge practical tests and precise measurements of the radiant effect, and to caution underwriters against the extravagant claims of parties interested in the sale of wire glass.

I made some experiments with wire glass almost as soon as it was put on the market, and from that day to this have recommended it with limitations.

I would most strongly welcome further practical tests which shall show more definitely what these limitations are. Such tests, so far as I can learn, have not yet been made, and until they are made we should be conservative.

The mere fact that a physicist reports a certain kind of glass as cutting off 83 per cent. of the radiant heat rays may be almost meaningless, in comparison with a few experiments at some well-equipped fire protection laboratory.

There is not only reason to expect that the radiant heat of a severe conflagration would pass through it so as to ignite wood, or fibrous materials, two or three feet inside the window, but there is also danger that the common galvanized sheet steel frame so commonly used for holding the glass, will soon become weakened by rust, like other galvanized sheet metal exterior house trimmings.

JOHN R. FREEMAN.

Personalties

—Mr. Holland Wheeler has been appointed city engineer of Lawrence, Kan.

—Mr. Albert Rhame has been appointed city engineer of Red Wing, Minn.

—Mr. E. F. C. Harding has been appointed city engineer of Jefferson City, Mo.

—Mr. C. M. Thorpe, city engineer, of Bozeman, Mont., has been re-appointed.

—Mr. Clinton L. Shearer has been appointed city engineer of Beaumont, Tex.

—Mr. John W. Hackney, city engineer at Atlantic City, N. J., has been re-elected.

—Mr. G. H. Kimball has resigned his position as assistant city engineer of Little Rock, Ark.

—Mr. Henry M. Dickson has been appointed assistant city engineer at Fort Worth, Tex.

—Mr. David Morey has been appointed superintendent of the water-works of Troy, N. Y.

—Mr. Clark G. Anderson, of Peoria, Ill., has been appointed city engineer of Moline, Ill.

—Dr. D. L. Cheatham was elected mayor, and Mr. M. D. Jameson, treasurer, of Sandersville, Ga.

—Mr. Fred W. Gow, superintendent of water-works and sewers of Medford, Mass., has resigned.

—Mr. Charles T. Hayden, superintendent of the Water and Sewer Board of Rome, N. Y., has resigned.

—Mr. Garnett D. Baltimore has been appointed landscape engineer of the park department of Troy, N. Y.

—Mr. S. Y. High succeeds Mr. W. G. Goodwin as superintendent of the water-works of Kansas City, Mo.

—Mr. J. W. Vogleson, of 1810 Chestnut street, Philadelphia, Pa., has been appointed assistant city engineer of Manila, P. I.

—Mr. S. D. Temple has resigned his position as city engineer of Anacortes, Wash., and has been succeeded by Mr. Donald A. Duff.

—Mr. J. M. Bandy, former city engineer of Greensboro, N. C., has been succeeded by Mr. W. G. Potter who was recently elected to that position.

—Mr. A. L. Pond, of Coldwater, Mich., has resigned his position as the superintendent of the municipal water-works and electric light department.

—Mr. Robert Nelling succeeds Mr. W. H. Glore as superintendent of the water-works of Covington, Ky. Mr. Glore has held that position since 1875.

—Mr. R. Keith Compton, having been appointed assistant city engineer of Baltimore, Md., will have charge of grading and paving in the burnt district.

—Mr. W. A. Clements, assistant city engineer of Toronto, has been appointed city engineer of Vancouver, B. C.

—Mr. D. A. Brotherton has been appointed city engineer of Escanaba, Mich.

—Mr. George A. Vollmar, of Brooklyn, N. Y., has been appointed assistant engineer of the Aqueduct Commission.

—Mr. P. A. McCarthy, city engineer, of Lufkin, Tex., has been re-appointed.

—Mayor John P. Studley of New Haven, Conn., began his third term on June 1st. At the same time Mr. Edward A. Street was sworn in as city clerk and Mr. S. Fred Strong as city engineer.

—Mr. F. A. Hoffman, whose resignation as superintendent and treasurer of the water-works department of New Brunswick takes effect September 1, will be succeeded by Mr. Jacob H. Whitfield.

—Mr. Charles Varrelmann has resigned his position as street commissioner of St. Louis, Mo., and has been superseded by Mr. Frank W. Valliant, former sewer commissioner, who was appointed in his place.

—Mr. Chas. H. Haswell has been employed in doing engineering work for the municipal government of New York for seventy years, and is still an assistant engineer in the office of the Board of Estimate and Apportionment. He celebrated his ninety-sixth birthday on May 22d, last.

Convention Dates

July

—National Conference of Charities and Correction, Portland, Ore., July 15-21. Alexander Johnson, secretary, 105 East 22d street, New York, N. Y.

August

—League of American Municipalities, Toledo, O., August 23-25. John McVicar, secretary, Des Moines, Ia.

—International Association of Fire Engineers, Duluth, Minn., August 16-19.

—National Firemen's Convention, Kansas City, Mo., August 29-31.

—International Association of Municipal Electricians, Erie, Pa., August 23-25. F. P. Foster, secretary, Corning, N. Y.

—American Public Works Association, Chattanooga, Tenn., August 30-31. W. H. Flint, secretary, Chattanooga, Tenn.

September

—American Society of Municipal Improvements, Montreal, Can., September 5-7. George W. Tillson, secretary, Municipal Building, Brooklyn, N. Y.

—New England Water-Works Association, New York, N. Y., September. William Kent, secretary, Narragansett Pier, R. I.

October

—American Civic Association, Cleveland, O., October 4-6. Clinton Rogers Woodruff, secretary, 121 South Broad street, Philadelphia, Pa.

December

—American Economic Association, Baltimore, Md., December 26-30. Frank A. Fetter, Morril Hall, Ithaca, N. Y.

Municipal Gas Profits in Leeds*

THE results of the operation of the Leeds gas works by the corporation for the fiscal year ended March 31, 1905, have just been made public. They appear to prove that the management of the city lighting by the corporation has been as successful as the management of the street car system is claimed to be.

The gross profit is stated to be $502,665. Of this sum interest on loans, etc., absorbs $225,725, leaving a net profit of $246,940, from which amount $146,205 for the redemption fund has to be deducted. There is thus left a surplus profit of $100,735, the whole or greater part of which will, if precedent is followed, be applied in the relief of the rates.

This surplus profit is $42,960 less than in the previous fiscal year, accounted for, it is claimed, by the fall in the price of residuals, such as coke and tar. It was estimated at the beginning of the year that the gas committee would have $150,000 at their disposal at the end of the year, and that sum would have been exceeded by $10,000 if the selling prices of residuals of the previous year had ruled. On the basis of the prices of 1903-4 the income from residuals would have been about $20,000 more than they were.

It is interesting to know that these results have been produced under two political régimes, the conservative party having control of the gas works for seven months and the liberals having oversight of them for the remaining five months. Both parties seem to be interested in making municipal management of the gas works successful in Leeds.

Fire and Police Personals

—Wilson F. Clark is the new chief of the fire department of Waterbury, Conn.

—Fire Chief Wortz, of Malvern, Ia., has resigned to be succeeded by Charles Brothers.

—Woodhull N. Raynor has been elected chief of the fire department of Sayville, L. I., N. Y.

—William F. Geitlinger has been elected chief of the fire department of Woodhaven, L. I., N. Y.

—Mr. A. S. Allen has been appointed chief of the re-organized fire department of Uxbridge, R. I.

—W. K. Ayres has been elected chief of the fire department of Kearney, Neb., for the third time.

—LeRoy W. Cowles has been appointed chief and W. J. Noble, assistant chief of the fire department of New Britain, Conn.

—Mr. James B. Crowley has been elected to succeed the late Benjamin H. Richards as chief of the police department of Newport, R. I.

—The vacancy caused by the death of E. J. Cameron, chief of the fire department of Dawson, Ga., has been filled by W. P. Skelton.

* From United States Consul Hamm, Hull, England.

Fire Protection in Rochester

A special committee of the National Board of Fire Underwriters on "Fire Conditions in Rochester," recently made a thorough investigation of conditions in that city, making a long report consisting of seventy-nine different items, in which the committee considered the city was derelict in providing sufficient fire protection for the city. The matter was referred by the Mayor to City Engineer Fisher, who made a second investigation, and found that almost without exception the city had either more than met the requirements of the Board of Underwriters, had the work of making such improvements under way, or were already taking steps to bring about such improvements.

The general conditions of the water supply for fire protection in Rochester consists of: (1) the domestic system covering the entire city; (2) the Holly system of fire mains 19½ miles in length, distributed in the congested district; (3) three mill races which have a supply of water at all times and convenient means of access for the use of steamers, which constitute in the aggregate a large reservoir of almost inexhaustible supply for over a mile in length in the highly congested district; (4) the Erie Canal, extending diagonally across the city for a distance of five and one-half miles, passing through the congested district. This canal is kept full of water for seven months, and during the remainder of the year has more or less water for a portion of the distance.

The domestic or gravity system has at present 285 miles of mains, covering the entire inhabited portion of the city. The original works were completed thirty years ago, and cost about $3,500,000. From that time to 1893-4 adequate extensions of the system were made, when an additional conduit line from Hemlock Lake to Mt. Hope Reservoir was constructed, which cost, including the water rights, $1,884,000.

The first conduit in 1893 had a capacity of about 6,800,000 gallons, while the addition of the new conduit increases this to 25,000,000 gallons.

In 1894-5 two main distributing pipes from Mt. Hope reservoir to the central portion of the city, together with other betterments of the distributing system were made at a cost of $252,000. From 1896 to 1903 inclusive the betterments of the water-works system aggregated nearly $500,000. Betterments to the domestic system made in 1904-5 up to date aggregated nearly $400,000. In process of construction at the present time are four miles of additional distributing pipe, together with additional hydrants costing about $75,000, and expenditures for other purposes will bring the total cost of work now in progress at over $200,000.

In addition to this there are contemplated improvements which include the construction of an additional reservoir aggregating $715,000.

The conditions in the fire department show up to equally good advantage. They are enumerated by Mr. Fisher as follows:

"On January 1, 1902, the steam engine equipment of the fire department system consisted of six second-class engines rated at 700 gallons capacity per minute each, and two third-class, rated at 600 gallons; making a total nominal rated capacity of 5,400 gallons per minute. Four of these engines were reported by the Chief to be in poor condition.

"Since that time six first-class 'Metropolitan' engines, rated at 900 gallons per minute each, have been purchased. Five have been received, and the last one is now ready for delivery. Furthermore, two of the second-class engines have been rebuilt, and another will be rebuilt this year.

"The rated capacity of the engines at present is: Six second-class, 4,200 gallons; one third-class, 600 gallons; six first-class, 5,400 gallons; making a total capacity of 10,200 gallons per minute, or more than double the actual capacity on January 1, 1902.

"In addition to the engine equipment there has been put in service since January 1, 1902, one 'Champion' water tower with an extended height of sixty-five feet, and an additional water tower is now ready for delivery.

"Cost of additional equipment: six first-class Metropolitan engines, $33,000; two Champion water towers, $13,000; three combination hose wagons, $6,000; three engines rebuilt, $6,000; 22,000 feet of new hose, $18,000; additional buildings on Hudson and Monroe avenues, $40,000; making a total of $116,000, of which over $75,000 has been expended, or authorized, to date, since January 1, 1904.

"There has also been expended and authorized for placing wires of the fire alarm telegraph underground, since 1902, and including the appropriations of the present year, $24,300; and for police wires, $11,500; making a total of $35,800, $23,000 of which has been expended, or authorized to date, since January 1, 1904.

"In addition to the foregoing, arrangements have been made for the purchase of a site for fire department headquarters, repair shop, storage of extra apparatus, fire alarm telegraph, etc.

"The expenditure for the above property, including a new fire alarm system installed in this building will be about $200,000.

"The force of the department has been increased from 210 to 258 men, thirty of whom were appointed during the month of March, 1905.

"The total expenditure for betterments to the fire department since January 1, 1902, including the estimated amount to be expended this year, thus aggregates about $312,000."

The Water Department of New London, Conn., has earned $754,938.79 in its 33 years of existence. Of this amount $376,000 has been paid over to the city in cash, and $378,938.79 expended in extensions and improvements. The revenues from water rates for 1904 exceeded those of the year previous by $2,340, and those of ten years before by nearly 50 per cent. Water is drawn from Konomoc lake and distributed through the city through 61 miles of mains and 16.8 miles of temporary mains and service pipes. The average daily consumption is estimated at 1,600,000 gallons, or 80 gallons per capita. The cost of supplying 1,000,000 gallons is estimated at $54.65. There are 294 meters in service. The question of the use of water for power is presented by Superintendent W. H. Richards, with the recommendation that it be charged for at meter rates.

Chicago's Water Supply

THE water system of Chicago, Ill., is comprised of ten pumping stations, five intake cribs, 1,978 miles of mains, 20,349 hydrants, 16,095 tap valves, and 220,000 taps, of which 8,102 are metered. There are thirty-eight miles of tunnels running from intakes, which are from two to five miles out in Lake Michigan, to the pumping stations, and seventeen pipe tunnels under the river. The city annexed several towns in 1889, each having an independent water system. In order to unify these with its own, Chicago has laid in the past few years over fifty miles of sixteen-inch to forty-eight-inch mains. To properly take care of these additions the pumping capacity has been increased over 180,000,000 gallons per day. The growth of the city has been so rapid that more additions have been required, and this year there has been authorized two additional 40,000,000-gallon pumps, one 20,000,000-gallon and one 3,000,000-gallon pump. There also will be constructed a new pumping station and tunnel for the southern part of the city, but this will not be completed until 1909. In that year Chicago will have a maximum daily supply of 690,000,000 gallons and a minimum daily supply of 520,000,000 gallons. The present daily pumpage is 400,000,000 gallons, or about 200 gallons per capita, and when the increase in population is taken into consideration, the city engineer, Mr. John Erricson, believes that the per capita supply will be 217 gallons. He advocates the construction of two independent tunnels, with cribs and pumping stations, one to be located in the northernmost part of the city and the other south of and close to the stock yards, the latter to have a daily capacity of 50,000,000 gallons. If these additions are made there will be a maximum and minimum supply of 940,000,000 and 750,000,000 gallons, respectively, which, at the present growth of the city, would be overtaken in about 1919. This would provide a per capita supply of 230 gallons, but he believes that the per capita consumption in that year will be 250 gallons. He has recommended the installation of water meters—as he believes the waste and leakage to be enormous—but this has not met with favor. By the general introduction of the meter system he believes that the additions to the pumping system would not have been necessary for several years.

Freight Railroad Tracks on Public Streets

THE construction and maintenance of spur tracks connecting warehouses and manufactories with existing lines of railroad in San Francisco is occupying considerable attention. Some time since, the Drayman's Association and the Teamsters' Union formed a combination to prevent the construction of any more spur tracks of this character, and if possible, to secure the removal of tracks already in existence, claiming that under the new charter recently adopted by San Francisco, there is no authority for the construction or maintenance of such spur tracks.

Their efforts in this behalf are purely selfish, seeking to give themselves more employment in requiring all goods to be hauled in drays and wagons, and not considering that if their efforts are successful a great many hundreds of other labor union men will be deprived of employment. Unfortunately, their ground of contention is pretty strong, the only reference to spur tracks in the charter being the following, under the head of "Powers of Supervisors." "The Supervisors shall have power: * * * To permit the laying down of railroad tracks and running cars thereon, along any street or portion of a street, for the sole purpose of excavating and filling in a street or portion of a street or the adjoining land, for such limited time as may be necessary for such purpose and no longer."

It was sought at the election held in November of last year, to secure an amendment to the charter to correct this defect; but this and other amendments could not be voted upon, the Supreme Court upholding the contention that a sufficient time had not elapsed since the previous amendments had been submitted to the people, the charter requiring that fully two years' time must intervene. Consequently, this needed amendment cannot be acted upon until November, 1906.

In the meantime, the Board of Public Works, which is Labor Union in its politics, with a labor union mayor, is refusing to allow the construction of spur tracks. The Supervisors are continuing to grant such permits, fifteen of them having been given during the past year, only to be held up by the Board of Public Works, which under ordinances of the Supervisors and sections of the charter has the control over public streets, it being provided that no streets can be opened or torn up without a permit from that body. Although this control was intended to be only supervisory and to be exercised only under ordinances of the Supervisors, up to the present time the Board of Works has been able to prevent any action on such ordinances passed by the Supervisors.

During the last session of the State Legislature of California a measure was passed through both branches on March 1, 1905, giving governing bodies of municipal corporations authority to allow the construction of spur tracks from manufactories and industrial enterprises to connect with existing lines of railroads, said bill having been signed by Governor Pardee on March 22, 1905. This bill was strongly opposed by the labor unions. The question is yet to be determined whether a general act of the State will affect a municipal corporation to which a charter has been granted. There are several suits pending, and this question will be decided in their determination.

THE HOME GARDENING ASSOCIATION, of Cleveland, Ohio, distributed 237,393 packages of seeds and bulbs to school children last season, and is preparing to meet a greater demand this year. In idea, the movement is a completement to Governor Pingree's potatoe patches, and cultivates the aesthetic taste in children as that encouraged the practical for older folks, through exhilarating work in the soil. Competition between schools is encouraged by prizes awarded for the best gardens, and by flower shows which add a stimulus to childish pride. The interest of the children in the work is showing itself in the improvement of lawns and odd patches, and is reflected in a generally improved appearance of the dwellings. So successful has been the experiment in Cleveland, that it is being tried by neighboring cities.

Municipal Paving Brick Plant

The advisability of establishing a municipal asphalt plant in Detroit was up for discussion during the administration of D. W. H. Moreland, a former commissioner of the local board of public works, but the opposition of the commissioner prevented the building of the asphalt plant until last year. In the Detroit Common Council, the proposition providing for the municipal manufacture of paving material has been kept actively alive by Alderman E. J. Jeffries, who is an enthusiastic believer in the principle of municipal ownership and operation of public utilities of all kinds. Alderman Jeffries has made a splendid fight for a municipal brick plant, and he has been ably seconded in his efforts by the present commissioner of the board of public works, William H. Maybury.

Alderman Jeffries, with the assistance of Commissioner Maybury, recently secured an appropriation from the Common Council which provides that $50,000 may be expended by the city for a brick plant. Bids and specifications were advertised for. Three propositions have been received which call for expenditures ranging from $46,000 to $50,000 each; another bid is expected soon, but it is quite possible that all of the bids may be ignored and the matter readvertised. In comparing the bids, now in, the committee having charge of the matter, finds it very difficult to decide which is the lowest, owing to the difference in the specifications which have been filed with them. Some of the bidders, whose figures are higher than others, claim that the plant that they intend to furnish is enough better than those that their competitors will build, to more than make up the difference in the bids. The matter will be decided soon, and it is probable that definite specifications will be decided on and that bids will be asked for on these specifications, so that the committee can settle the matter as to which is the best proposition for the city.

For the present season's paving operations, the city has already contracted 5,000,000 paving brick, at a cost of $18 per thousand. The contracts have been equally divided among the following firms: The Hocking Valley Brick Company, the Nelsonville Brick Company, the Logan Brick Company, the Collingwood Brick Company, and the Robinson Brick Company. Alderman Jeffries believes that Detroit can make brick for $13 per thousand, but he also believes that there are other economies which the brick plant will make possible which will help to swell the amount saved by the city in securing cheaper brick. He urges, that to keep the pay roll at home is an important thing for the laboring men of the city. He also explains that the competition among paving contractors will be much more active, as men can go into the business on much smaller capital than is needed where brick is not furnished by the city.

The American Blower Works, of Detroit, is manufacturing machinery which is said to reduce the cost of making paving brick greatly, and it is believed that the local plant will be equipped by this firm. The new system is said to be arranged with a fan draught, by which the heat from a finished kiln is drawn off into another, in which the fire is just being started, instead of allowing it to be lost in the atmosphere, as formerly. The material used will be shale, which can be secured at Flushing, Mich., a small town seventy miles from Detroit. The city has a proposition from a Flushing party to furnish shale for $1.20 per ton, laid down in Detroit. It is estimated that five tons of shale will make one ton of brick. For making the brick, $2 per ton is allowed, and $2.50 per ton is allowed for burning. In addition to the above amount, it is estimated that the depreciation of the property would bring the cost of the brick up to about $13 per ton.

The Weaver of Philadelphia

'Twas not so long ago, John,
The preachers prayed for you;
They called you base, and so, John,
The people thought you, too.
They classed you with the Gang, John,
Attempting to infer
That you in time might hang, John,
Because, in fact, you were

A Weaver of plots,
A Weaver of toils,
A Weaver of lies,
A Weaver of spoils.
But now times have changed and the Public believes
You're a Weaver of nets to entangle the thieves.

Your tic-tacs beat the Dutch, John,
You've turned the trick, my boy.
You've worked an ambush such, John,
As Togo might employ.
You've caught 'em in the straits, John,
And Durham's fleet you blew
To Satan's yawning gates, John;
So now they speak of you

As a Weaver of good
And a Weaver of right,
And a Weaver of laws
That are honest and white;
And it's bully for you, since you're Weaving across
The den of the thieves to entangle the Boss!

You've proved yourself, and so flies
Your fame as well it should;
When the Spider traps the blow-flies
He does a world of good.
And may the fabric grow, John,
Beneath your Weaving hands
Till every man shall know, John,
Your record as it stands:

A Weaver of snares
That the Robbers can't cross,
And a Weaver of cares
For the Thug and the Boss;
And thus a clear future shall lie in your powers
As a Weaver of good for this Nation of ours.

—Wallace Irwin in "The Globe."

Village Improvement*

THE only safe procedure, when one goes a single step beyond the neat and orderly provision for generally recognized practical necessities of the village, is to look fairly and squarely into the future, to adopt a definite and comprehensive plan and policy, and never to undertake or accept a project of improvement without earnestly and deliberately comparing its probable results with the aims of the plan. However wise and comprehensive they may be, such general plans must from time to time be modified, but the modifications should be thoughtfully and deliberately accepted, not drifted into hap-hazard.

A savage, forced by the limitations of his condition, may live upon a spare and healthy diet. Give him the opportunities of civilization, and he will gorge himself with indigestible combinations, selected at random from among the endless number of things that individually please his palate. The civilized man may be equally fond of the same things, but when he wants a good dinner he resolutely rejects nine-tenths of the things which please him on the bill of fare, for the sake of adequately enjoying what he elects to have at that particular place and time.

What village improvers seem often to forget is that their selections from the bill of fare are not for a day only, but for many years, and must be considered in relation to the selections of the past and of the future for the locality in which they are to occur.

* Frederick Law Olmsted, Jr., in the June *Atlantic*.

The Firemen's "Quiz"

BEFORE a member of the Buffalo Fire Department can be promoted to the rank of captain or lieutenant he must pass a creditable examination. This examination is held under the new civil service law and the questions given below were those used at the first examination a few days ago.

There were 117 first-grade firemen who tried the examination for lieutenant and 36 first lieutenants to try the examination for captain. There are already vacancies in each rank, so that the men who come out on top are sure of immediate appointments. The questions submitted for the captain's examination were as follows:

Upon receiving an alarm of fire, what are the duties of a captain at quarters, on way to fire and duties upon arrival at fire? Explain in full.

How should a company be manned at all times?

Explain in full what the captain's duties are in regard to the buildings in the company's district.

What are the duties of captains regarding inflammable materials in the company's district?

Where should a captain station himself at a fire?

Is a journal kept by a company? If so, what does it contain?

What are the captain's duties when assigned to the office of battalion chief when chief is absent?

Explain in detail duties of a captain at 10 o'clock in the morning.

Through what official channels should captains report accidents or misconduct of men?

Of what does the uniformed force of the department consist?

The ten questions given in the lieutenant's examination were:

What are the duties of a lieutenant? Explain in full.

Are members of the department allowed to receive rewards or presents? If so, when?

State the provision in the rules regarding political meetings, etc.

What days, if any, are all members of the department required to be present on duty?

What is the duty of the first company upon arriving at a box from which an alarm has been given and finding no fire?

When in command of a company, where should a lieutenant station himself?

How shall a company be manned at all times?

What officer of a company can grant leave of absence or suspend from duty?

What is a fireman's duty regarding conviction of persons sending in false alarms?

Is smoking allowed in stables? In quarters?

Salaries of Firemen

ACCORDING to the last census, pipemen, laddermen and drivers in the fire departments of the principal cities in the United States are paid as shown in the following table:

	Population.	Monthly Pay.
New York	3,437,202	$83.00 to $116.16
New Orleans	287,104	60.00 to 65.00
Newark, N. J.	246,070	62.00 to 91.00
Pittsburg	321,616	80.00 to 90.00
Hartford, Conn.	79,850	66.66 to 83.33
San Francisco	342,782	80.00 to 100.00
Allegheny, Pa.	129,896	90.00 to 95.00
Cleveland	381,768	92.00 to ....
Cincinnati	325,902	90.00 to ....
Detroit	350,000	55.00 to 75.00
Atlanta, Ga.	89,872	68.00 to 70.83
Milwaukee	285,315	80.00 to ....
Denver	133,859	85.00 to ....
Paterson, N. J.	105,171	70.00 to 91.66
Memphis	102,320	75.00 to ....
Seattle	80,671	70.00 to 80.00
Salt Lake City	53,531	65.00 to 85.00
Baltimore	508,957	66.00 to 75.00
Boston	560,892	75.00 to 100.00
Philadelphia	1,293,697	83.33 to 91.66
Chicago	1,698,575	80.00 to 94.50

STREET IMPROVEMENTS IN DULUTH, MINN., cost during the past year $279,667. Sanitary sewers aggregating 18,782 feet in length and costing $24,551 were laid and storm sewers 6,432 feet long costing $23,938. Over 600 feet of cement and 28,324 feet of plank sidewalks were laid. Estimates for future work aggregate $1,066,955. The city engineer advocates that all excavations in the streets be under the control of the city board to insure the proper replacement of the street.

Telephone Messages in United States

STATISTICS for the year 1902 show that a total of 90,834,789 telegraph messages were sent in the United States; 4,611,271,580 pieces of first-class mail matter, and 5,070,554,553 telephone messages; that is, the telephone served as a means of personal communication in more instances than the mails and telegraph combined, and was used fifty-six times as often as the telegraph.

The accompanying table indicates that the number of telephones depends upon the density of the population and upon the character and the extent of the business and industries of the locality served. Alabama had 134 persons to each telephone, and Mississippi, North Carolina and South Carolina over 100 persons per telephone, while California, Indiana, Iowa, Ohio and Washington each had one telephone for less than 20 persons.

STATE OR TERRITORY.	Stations or telephones of all kinds.	Messages or talks during year.	Estimated population.	Average population per telephone.	Average number of messages per capita.	Average number of messages or talks per telephone per year.
United States..	2,315,297	5,070,554,553	78,576,436	34	65	2,190
Alabama	14,077	46,158,943	1,891,755	134	24	3,279
Arizona	3,259	5,072,727	129,869	40	39	1,557
Arkansas	16,892	36,716,883	1,847,934	80	27	2,174
California	106,574	178,284,400	1,537,837	14	116	1,673
Colorado	24,533	60,258,533	559,715	23	108	2,456
Connecticut	22,494	35,933,102	941,184	42	38	1,597
Delaware	4,293	8,962,892	187,461	44	48	2,088
Florida	8,216	18,906,002	554,104	67	34	2,301
Georgia	25,490	96,192,066	2,298,713	90	42	3,774
Idaho	3,862	6,451,762	176,416	46	37	1,671
Illinois	211,187	541,161,932	5,019,628	24	108	2,562
Indian Territory	5,331	8,337,959	434,436	81	19	1,564
Indiana	132,489	294,657,565	2,581,575	19	114	2,224
Iowa	120,017	193,054,738	2,301,427	19	84	1,609
Kansas	40,972	58,699,143	1,452,217	35	40	1,433
Kentucky	46,266	143,101,564	2,202,804	48	65	3,093
Louisiana	17,509	68,083,915	1,434,033	82	47	3,888
Maine	14,045	21,923,915	700,072	50	31	1,561
Maryland[1]	32,090	62,019,081	1,605,558	47	41	1,933
Massachusetts	96,512	183,115,320	2,917,796	30	63	1,897
Michigan	93,961	237,695,112	2,480,764	26	96	2,530
Minnesota	62,039	113,124,262	1,822,106	29	62	1,823
Mississippi	15,069	60,414,961	1,605,604	106	38	4,009
Missouri	93,371	242,309,227	3,187,031	34	76	2,595
Montana	5,421	11,352,976	266,120	49	43	2,094
Nebraska	36,153	73,227,030	1,087,526	30	67	2,025
Nevada	1,165	1,409,134	41,331	35	34	1,210
New Hampshire	9,949	16,987,012	418,602	42	41	1,707
New Jersey	48,980	56,171,223	1,969,821	40	29	1,147
New Mexico	2,481	4,297,920	202,316	81	21	1,732
New York	246,015	360,098,123	7,583,011	31	48	1,464
North Carolina	16,252	36,485,398	1,948,984	120	19	2,245
North Dakota	6,762	14,106,733	344,778	51	41	2,086
Ohio	222,767	558,707,801	4,252,372	19	131	2,508
Oklahoma	10,385	23,329,668	463,312	45	50	2,246
Oregon	21,172	35,777,238	429,380	20	83	1,690
Pennsylvania	186,572	493,617,718	6,505,887	35	76	2,646
South Carolina	10,467	23,893,914	1,378,150	132	17	2,283
South Dakota	10,305	17,919,604	429,808	42	42	1,739
Tennessee	36,060	128,274,719	2,070,354	57	62	3,557
Texas	64,410	167,079,014	3,208,303	50	52	2,594
Utah	5,734	11,755,130	289,519	50	41	2,050
Vermont	12,112	19,075,847	345,885	29	55	1,575
Virginia	24,130	65,494,626	1,899,440	79	34	2,714
Washington	31,447	64,623,982	558,055	18	116	2,055
West Virginia	22,376	41,605,891	998,004	45	42	1,859
Wisconsin	61,145	101,594,728	2,127,974	35	48	1,662
All other states[2]	12,489	23,033,120	544,465	44	42	1,844

[1] Includes District of Columbia.
[2] Includes Rhode Island and Wyoming.

Indian Territory, North Carolina and South Carolina had an average of less than 20 messages per capita, and California, Colorado, Illinois, Ohio and Washington each exceeded 100.

There are 4,151 systems; 4,850,486 miles of wire; 2,315,297 telephones; 14,124 salaried officials, and 64,628 wage-earners. The total revenues were $86,825,536; total expenses, $80,147,490, and the net surplus was $6,678,046. The actual cost to the companies averaged $1.06 per hundred messages, and the profit earned by the companies averaged 13 cents per hundred messages, and the cost per telephone averaged $34.61. The capital stock aggregated, at par value, $269,180,076, and the dividends paid, $14,895,857, or an average of 5½ per cent.

Pasadena's Sewer Farm

THE Pasadena, Cal., Sewer Farm report for the past year is of such interest that, though having noticed the enterprise in years past, we mention it again.

In 1887, the city purchased a 300 acre tract, situated 4½ miles southeast of the limits, at a cost of $37,500, and after considerable litigation, acquired the right of transit over the intervening territory, and five years later, 1892, had completed its outfall sewer, consisting of salt glazed vitrified pipe, varying from 16 to 20 inches in diameter and on grades ranging from one foot to three and a half feet per hundred feet fall. The main pipe extends along the entire west side of the farm, with a lateral running eastward at about the middle and another from the farther corner, which is turned toward the center of the farm. There are openings from four to five hundred feet apart in the lines with outlets, controlled by gates, from which the sewage is taken to cover the area to be irrigated. From these openings head ditches are run from which lead furrows from two to six feet apart, covering the area to be irrigated.

The crops raised are barley, wheat, hay, pumpkins and corn. Nothing is raised for human food that could come in contact with the sewage. In 1892, sixty acres were planted to English walnuts, which has been increased to 117 acres.

The sewage is kept in the walnut groves from December until the foliage comes out in April, and then turned into the open fields, and at harvest time, when all the labor is employed in caring for the crops, it is disposed of to neighbors, who eagerly avail themselves of the opportunity.

From four to ten days is the limit that the sewage is turned on one tract at a time, after which the ground is thoroughly ploughed or cultivated. If the weather is hot and dry the period of irrigation reaches the maximum, and, if damp and the odors do not rise readily, the minimum only is necessary.

The secret of success is in abundant sunshine and a dry climate, coupled with thorough and constant cultivation.

There were raised from the farm in the past year 56,625 pounds of walnuts, sold at 11 cents per pound; 304 tons of hay, worth $15 per ton; 1,500 bushels of corn, worth $1.35 per hundred, and 275 tons of pumpkins, selling at $2.50 per ton at the farm. Hogs are raised, which are fed on growing barley and sugar cane, and fattened on corn and pumpkins. And horse raising will be undertaken in the immediate future.

An additional 160 acres has been purchased in 1904, at a cost of $24,000, which will be paid for without the issue of bonds or tax levy.

The total expense for the past year was $6,310.91, and the receipts $11,643.57, leaving a profit of $5,332.66, or an average per acre of $17.77, compared with $4.46, the average per acre for the United States.

Corporate Operation of Filtration Plants

WHEN a municipality, either because it is up to the limit of its borrowing capacity or for any other reason, wishes to establish a plant for the purification of its water supply, it can do so upon favorable terms through the Pennsylvania Maignen Filtration Company of Philadelphia, Pa. This company has recently entered into an agreement with the city of Lancaster, Pa., for the establishment of such a plant, and it is willing to install similar plants elsewhere upon the same terms.

To be explicit, this company agrees to erect and operate a filtration plant, on the slow sand principle, with its own money, provided the city will pay $15 per million gallons for the purification of the water. A comparatively large number of municipal filtration plants have been installed during the last few years, and some are now in process of construction. Many of these plants have fallen short of expectations. For this reason it may seem expedient to the average municipality to rent, so to speak, a filtration plant as an individual would rent a house, thus having an opportunity to obtain a plant which is satisfactory in every particular. Under these conditions any alterations or improvements which may be required will be made at the expense of the company and not at the expense of the city.

In the case of Lancaster, it happens that the indebtedness of the city is very close to the limit of its borrowing capacity. Although it was in immediate need of some method of purifying its water supply, yet a number of years would have to elapse before the city could borrow enough money for the establishment of such a plant. By the arrangement described above the city has the benefit of a pure water supply without delay, and is thus permitted to bide its time for the purchase of a plant. The plant will have a minimum capacity of 5,000,000, and a maximum capacity of 9,000,000 gallons daily.

Every five years the city will be given the oportunity to purchase the plant at a fixed price, diminishing as time goes on—stipulated in the agreement. After thirty-five years, if not purchased before, the plant becomes the property of the city.

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MUNICIPAL ADVERTISING.—The Chamber of Commerce, of Idaho Springs, Colo., has prepared a beautiful booklet, printed in colors and handsomely illustrated, descriptive of the municipality and its resources including its gold mines, the invigorating powers of its mineral springs and of its attractive scenic splendor. The booklet is in its fifth edition, which, when all distributed, will aggregate 100,000 copies. This, for a Chamber of Commerce in a small city of 3,000 people, shows remarkable enterprise. Among its municipal features are included a large park projected and under way, a Carnegie library, three public school buildings, seven churches, two electric lighting plants and a steam heating company. The booklet is copyrighted and any city official who wishes to learn of an up-to-date method for advertising his city can secure a copy by applying to the Chamber of Commerce.

A Primitive Chemical Fire Engine

THE chemical fire engine shown in the accompanying illustration is one of the first chemical extinguishers to be placed on wheels. It was made in Boston in 1871 by the late J. Hinman and is still in service although it is soon to be replaced by one of larger capacity.

The chemical fire engine was invented by Prof. James Babcock, of Boston. He discovered that the pressure given by uniting bi-carbonate of soda with sulphuric acid in water was sufficient to throw the water far enough for fire fighting purposes. His invention was first utilized by John S. Damrell, Chief of the Boston Fire Department, who carried fifteen of the portable extinguishers to a fire in 1871, the mode of transportation being a milk wagon.

AN OLD BABCOCK CHEMICAL HAND ENGINE.

New York City adopted chemical fire engines a year later and was the first city to draw them by horses. They were soon abandoned, however, for the reason that they did not give employment to enough men, and New York is the only city of prominence that does not use them extensively.

The idea of the portable fire extinguisher went on and now it is almost universally used on hook and ladder trucks and hose wagons, the only pieces of fire fighting apparatus that are adopted for use in both cities and hamlets. The combination chemical fire engine and hose wagon is but an improvement on the above and is very widely used. Boston, the city of their origin, uses more chemical fire engines than any other city in America.

Prof. Babcock was professor of chemistry in Massachusetts College of Pharmacy from 1870 to 1875, and at the Boston University from 1875 to 1880. He was also State Assayer for Massachusetts from 1875 to 1885, and milk inspector for Boston from 1885 to 1889. He died of consumption July 19, 1897, in Boston.

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THE NASHVILLE, TENN., BOARD OF PUBLIC WORKS SPENT $280,815 last year and built 7.67 miles of trunk and laterai sewers and almost two miles of new streets. There were 1,678,905 bushels of macadam used; 36,495 cubic yards of grading; 1,655 square yards of granite paving; 12,080 feet of curbing, and 16,991 feet of guttering constructed.

Village Improvement That Doesn't Improve *

I CONFESS that while I am pleased with all these things that have come in of late, and praise the work of architects and gardeners, engineers, and sanitary engineers, decorators and æsthetes, I do not think that the villages which have gained most from them, or from the admirable labors of beauty-organizing women, are likely to impress visitors of the best intuition and the highest culture as pleasingly, gratefully, and hopingly as those of the general character and aspect I have endeavored to recall.

There were then hundreds of villages of this general description, every one of which would now excite great admiration from men of good taste. They have now, at some points, taken on town airs, killing what remains of their former character; at other points, they have become neglected and slatternly. Lastly, the pursuit of beauty through decoration has set back any character they had, either as a local distinction, or as a class, which if found in Norway or Java would have been known as the beauty of an American village. The beauty, on the other hand, that they have acquired is largely a common extrinsic beauty, which might as well have been produced anywhere else. Much of it even would have been obtainable, and may even be found in greater degree and measure on the outskirts of large commercial towns, and in European or Australian towns, as well as in New England or Maryland.

* Frederick Law Olmsted, Jr., in the June *Atlantic*.

The London Fire Brigade

THE annual report of the Fire Brigade Committee of the London County Council for 1904 was issued on April 1st. The total fires reported to the brigade during the year were 3,616, or 216 more than in the previous year. The number of fires classified as serious was 67, as compared with 61 in 1903, but the average number of fires returned as serious during the 10 years ended December, 1903, was 135. Of the 318 persons whose lives were endangered during the year, 93 died from the effects of explosions or from injuries, suffocation, burns, or shock to the system. The number of persons who did not leave the building by the ordinary means (a reduction of 51 on 1903) was 318. Of these, the number who escaped with or without assistance, and who, in the cases in which injury was sustained eventually recovered, was 225. The number taken out alive, but who succumbed afterwards, was 62. The number of those who died and were removed from the building before the brigade was called was 22. The number of those who were found dead by firemen was nine. The timely arrival of horsed escapes turned out immediately in response to calls, the report remarks, has again resulted in the rescue of persons who otherwise would have lost their lives, and the wisdom of withdrawing, on the introduction of the horsed-escape service, most of the manual fire escapes stationed in the public thoroughfares continued to be fully demonstrated.

The comparative figures of ten years in regard to loss of life showed the following result: 1895, 91; 1896, 106; 1897, 87; 1898, 98; 1899, 119; 1900, 74; 1901, 97; 1902, 116; 1903, 86; 1904, 93. The average number of fires per year from 1894 to 1903 was 3,528. During 1904 the number was 3,616. Of the fatal fires which occurred during the year, five were caused by accidents with candles, 16 by children playing with fire or matches, 14 by clothing catching fire, two by gas ignition, two by the ignition of methylated spirit, two by lights being thrown down, ten by mineral oil lamps or stoves, and eleven by sparks from fire grates. In 15 cases the cause was not ascertained. During the year third-class Firemen T. J. Lloyd and E. George were awarded the silver medal for "extraordinary bravery" in saving three lives at a fire in Egerton Terrace, Brompton, and Third-class Fireman A. Oates was given a similar reward for saving a life at Great Andrew street, Seven Dials. In all 34 officers and men were commended for special merit in saving 25 lives at seven different fires.

The staff of the brigade consists of one chief officer, two divisional officers, one assistant divisional officer, one senior superintendent, seven superintendents, seven district officers, 87 station officers, 171 first-class firemen, 154 second-class firemen, 627 third and fourth-class firemen, 36 men under instruction, 17 pilots, and 184 coachmen.

The number of accidents to members of the brigade was 208, one of which proved fatal. There were 527 cases of illness, one of which resulted in death. During the year 108 officers and men were struck off the strength of the brigade. The quantity of water used in extinguishing fires during the year was approximately 29 million gallons.

Pomona's Fire Alarm System*

THE city of Pomona has just put in a new fire alarm system which is comparatively inexpensive as compared with the patented systems and promises to give excellent results. It is described by the *Pomona Times,* as follows:

By the middle of May, or possibly a few days sooner, Pomona's fine new fire alarm system will be in operation. The steel tower has now arrived and is being placed in position on the lot in the rear of the fire hall. On this will be mounted the large bell, four feet across at the bottom, which will be struck with a thirty-pound hammer with a swing of two feet and six hundred pounds pressure behind each stroke. That will sound somewhat different from the old dinner bell which has served heretofore as a fire alarm. The apparatus which controls the system is the finest made. One fire alarm box is placed in each central telephone office and one in the city fire hall. On each telephone box in the city will be placed the number of the fire district in which the 'phone is located, and any person who telephones in a fire alarm will be expected to give the number of the fire district. The telephone operator then places on the fire alarm box the disc indicating the district named, pulls a lever, and the bell rings automatically the proper alarm for the district. At the same time an indicator in the fire hall shows the number of the district. In only one thing is the system different from the very best ones installed anywhere, and that is in the location of the fire alarm boxes. In large cities one or more such alarms are placed in each fire district, instead of in the telephone station. Here the telephone companies will act without compensation for the good of the cause, saving the expense of the many fire alarms.

* Pacific Municipalities.

INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told—Short Record of Happenings and Facts in City, Town and Village

FRANCHISE TAX IN NEW JERSEY.—According to the preliminary schedules of taxes for the current year on miscellaneous corporations doing business in the State of New Jersey, there are 5,514 in the list. The aggregate franchise tax which these corporations are required to pay amounts to $2,357,819.04, as compared with $2,296,459.81 for last year. The Prudential Insurance Company pays the largest amount —$204,011.01. The lowest amount paid is $.05, which is the aggregate tax for a corporation capitalized at $500.

SOUTH CAROLINA FIRE CHIEFS MEETING.—A meeting of representatives from the fire departments of the towns and cities of South Carolina was held in Columbia on May 30th, when the "South Carolina Firemen's Association" was organized. The following officers were elected: Louis Behrens, president, Charleston; M. Greenewald, first vice-president, Spartanburg; F. G. Austell, second vice-president, Union; R. S. Hood, secretary, Sumter; T. O. S. Dibble, treasurer, Orangeburg; J. A. Millikin, statistician, Columbia. It was decided to hold the first annual meeting at Columbia during the Fair week of this year. A resolution was unanimously adopted in favor of joining the "National Firemen's Association" and recommending all other departments to do likewise.

MAYOR OBJECTS TO GRANITE PAVING.—Mayor Mark Fagan, of Jersey City, objects to the extension of granite block pavement in his city. The chief objections are based upon its roughness, noisiness and unsanitary condition. In addition, the merchants along the street where it is proposed to replace a worn out granite block pavement with one of similar material assert that they prefer the use of asphalt from curb to curb, including the car tracks, for the reason that the latter was noiseless and could be kept clean with less difficulty. While the merchants understood that asphalt would wear out, they knew that the rougher pavement was detrimental to their business interests to the extent of many thousands of dollars annually.

WOMEN'S DRESSES HELP DISTRIBUTE GERMS.—Health Officer C. J. Ross, of Sioux City, Iowa, has had an ordinance introduced in the City Council forbidding women to wear skirts that touch the sidewalk and so stir up microbes. Dr. Ross declares, "The wearing of skirts is an utterly silly practice, and should be abolished altogether. The women can find some close-fitting garment that will be equally attractive and far more healthful than the flapping skirts from every standpoint of common sense, health and sanitation, and the trailing skirt should be relegated to oblivion. These long skirts pick up disease germs and carry them home, where they are distributed over the carpets, thus affording a fine opportunity for the infection of the children and infants of our homes." It is expected that the City Council will pass the ordinance.

NEW ORLEANS, LA., PAID $60,000 FOR ASPHALT REPAIRS last year, and the city council is considering building a municipal plant to do this work in the future. It is estimated that an expenditure of about $20,000 will be required to install a plant of the necessary capacity.

90-CENT GAS FOR BOSTON.—For several years there has been a wrangle between the city authorities and the various gas companies of the city of Boston, and a compromise agreement was settled upon by the last State Legislature. This was accomplished by a bill providing for the consolidation of all the Boston gas companies, with a capitalization of $15,124,600. Governor Douglas has signed the bill. Besides providing power, the bill makes it incumbent upon the corporation to reduce the price of gas in Boston to 90 cents per thousand cubic feet one year after it has taken possession of the gas plants.

CHIEF MAGEE'S ANNUAL REPORT.—Chief Magee, of Dallas, Texas, has submitted his eighth annual report of the fire department. This department has been organized as a paid department for twenty-one years, and while there is some apparatus much needed the department is in better condition than ever. For the fiscal years ending April 30th there were 454 alarms responded to, which is seventy-seven in excess of the previous year. Most of the fires were in frame buildings. The buildings involved in the fires were valued at $1,783,040 and the contents at $1,222,045, while the insurance on the buildings amounted to $1,006,572 and on contents $771,260. The total losses on buildings amounted to $90,953, and on contents $121,572, making a total of $222,525. It required $75,164 to meet the running expenses of the department last year.

REDUCED PRICE FOR LIGHTING IN NEW YORK.—One of the bills passed by the last New York State Legislature affecting gas and electric lighting in New York City has been signed by Governor Higgins, and will take effect July 1st. This bill fixes the price of gas furnished the city of New York for municipal purposes at 75 cents per thousand cubic feet. For electric light furnished private consumers not more than 10 cents per kilowatt hour may be charged, except that 12 cents may be charged in Kings County, and with the further exception that the bill shall not apply to the Fifth Ward of Queens Borough. The price for electric street lamps consuming 450 watts is fixed at $100 per year for an all night and every night service; $90 for electric street lamps consuming 325 watts; $65 per lamp where two electric street lamps are attached to a single pole. This is a heavy reduction in the prices previously paid. The New York Edison Company has already inserted advertisements in the daily newspapers, that this new schedule of prices will go into effect on July 1st.

Streets and Sewers in Knoxville.—The report of Thomas J. Moreland, city engineer of Knoxville, Tenn., for the year 1904, gives a total of 103 miles of streets within the city limits. There are three miles of brick pavement; 32 miles curbed and macadamized; 32 miles curbed, and 36 miles unimproved. During the year 3,700 yards of new macadam were spread at a cost of $1.10 per cubic yard; 4,400 linear feet of old curbing were replaced with concrete curbing and guttering at 28 cents per foot, and 763 feet of new curbing were set. There are 10,810 feet of brick sewer mains; 7,508 feet of terra cotta pipe mains; 1,227 feet of iron pipe mains, and 28½ miles of laterals. The number of house connections is 1,935. New work for the year was limited to an expenditure of $535. Engineer Moreland makes an earnest plea for more liberal appropriations for the ensuing year to enable the extension of work to keep pace with the rapid increase in population. During the year, 389 new dwellings have been built, all of which are occupied, which indicates a large addition to the population which must needs use the sewers and streets.

Municipal Funerals.—According to a French paper, on December 29th, 1904, it was decreed that the monopoly of funerals should be equally divided between the cities of France and the churches. The city has the exclusive right to transport the body, to decorate the exterior of the mortuary building and to furnish caskets. The Church, on the other hand, has the sole right to decorate the interior of the house of the deceased and to decorate the churches. From the mortuary buildings provided by the city there go forth each day 150 funeral processions, or 55,000 a year. Twelve hundred persons are employed in the industry, including offices, workshops, warehouses, stables, etc. A stock of materials to the value of a million dollars is carried. The services rendered by this branch of the Paris municipal government are divided into many classes, but only the first five are profitable. On all the others there is a net loss. The institution is required to furnish caskets and other materials free to the indigent poor. The charges in the first of the five classes on which a profit is made amount to $1,430, which includes $200 for the catafalque, each coachman and livery $3 and $1 extra for shoulder-knobs and $.80 extra for cockades. A standard of flags costs $5, and a war horse led by hand $8. The caskets vary in price from $9 to $60, according to material and finish. Although this department has been in operation but a short time, it is judged to be successful.

Cincinnati and Cleveland Water-works.—The editor of the "Citizen's Bulletin," of Cincinnati, has been at work these many months in throwing light upon the doings of certain city departments. The water-works department is the latest to receive attention. Comparing his own city with Cleveland, he finds that his own city has 40,000 water services to Cleveland's 60,000, while Cincinnati has 4,000 water meters and Cleveland has 30,000. From this he justly concludes that it should require a greater force in Cleveland to handle the bills rendered for meter service than for a similar service in Cincinnati. He calls attention to the fact that Cleveland issues 90,000 bills in three months for metered service, and additional 30,000 quarterly for the flat rate service, while in Cincinnati 12,000 bills for metered service and 36,000 for the flat rate would aggregate a total of 48,000 bills as opposed to 120,000 during the same period issued by the Cleveland department. The expense incident to the making out of these bills amounts to $346 a day in Cincinnati, while in Cleveland it only amounts to $274.58. If these figures are correct, as given by the *Citizen's Bulletin,* there is chance for some improvement in Cincinnati, to say the least.

Restriction of the Spread of Malaria.—According to a circular recently issued by the Board of Health of the State of New Jersey, malaria is conveyed to human beings only through the agency of the anopheles mosquito. Mosquitoes become infected by biting persons who are already affected with the disease. Mosquitoes can be destroyed (1) by removing all stagnant water; (2) by deepening ponds and pools which cannot be drained or filled up and introducing fish; (3) by clearing away obstructions and weeds from gutters and ditches to permit of free escape for storm water; (4) by destroying the larvæ with oil in situations where more radical treatment cannot be applied; (5) by destroying adult mosquitoes which hibernate in cellars, drains, cesspools, and other places by the use of the smoke of burning insect powder and by brushing them out and consuming them by fire.

Possible Telephone Competition in New York.—Since the enactment of the bill transferring from the Aldermen to the Board of Estimate and Apportionment the power to grant franchises, many applications for franchises have been received. One was from the Atlantic Telephone Company, which seeks the right to establish a telephone service in New York City. This corporation was organized in 1901, and has failed in several attempts to secure a franchise through the Board of Aldermen. The company is said to have a capital of $25,000,000, and intends to issue bonds to the extent of $15,000,000. The company claims that it already has conditional contracts with 75,000 residents in New York. A charge of only 5 cents per call anywhere within Greater New York is promised, and unlimited service to residences for $66 and for business purposes at $108 a year. The company is willing to pay the city 1 per cent. of its gross earnings for the first two years, 2 per cent. for the next three years, and 4 per cent. for the remaining twenty years of the twenty-five-year franchise period. In addition it will supply the city with five hundred telephones free of cost.

Using Refuse to Produce Power.—The city of New York will be the first American municipality to utilize refuse for the manufacture of electric current for lighting and power purposes. The city recently purchased 120 city lots in Long Island City, for $200,000, and another plot of ground between Ninetieth and Ninety-first streets, on the East side, for $350,000. On these two sites it proposed to erect refuse destructors which will convert all light refuse such as beds, bedding, mattresses, wash stands, bureaus, boxes, barrels, and similar material, most of which comes from tenement districts saturated with disease, into electri-

city for lighting the city's streets, parks, piers, and all its big East River and Harlem River bridges, besides using the current for heating certain public schools and furnishing power for the city's repair shops, dry docks, and fire and bridge departments. It is expected that 100,000 tons will be utilized in this manner, which, as has been demonstrated by actual tests, is equal to 20,000 tons of coal. A third plant is now in course of construction directly under the Williamsburg Bridge, at the Manhattan end. This plant will generate 400 h. p., most of which will be used for lighting the bridge.

♣

REPAVING BY GENERAL TAXATION.—Many American cities are puzzled to know just what practice to follow in connection with assessing property owners for the cost of repaving streets. Some maintain that the cost of repaving any street within the city limits should be paid out of the general tax fund, while others maintain it should be borne by abutting property owners. This question has been before the Legislature of Illinois for several years. It seems to have been finally settled by the passage of a bill providing that after local improvements in the way of paving streets and alleys have been made, and paid for by special assessments, that is, by abutting property holders, such payment shall be considered as perpetual and final, and that repairing and repaving should be done by general taxation. This act applies only to cities having a population of 25,000 or more by the last preceding census of the United States.

♣

POLICE DRAMA BY CHIEF MURPHY.—For several years it has been the custom of Chief of Police Murphy, of Jersey City, to devote his energies to a dramatic entertainment, showing the workings of the Jersey City police system. He is the author of the play which is entitled "In a Jersey City Police Station." Eleven performances were given last month, and all for the benefit of the Police Mutual Aid Society of the Jersey City department. All the actors were real cops. Captain John F. Kelly, of the Second Precinct, assumed the role of Commander of the Precinct, in which part he covered himself with glory. Sergeant Closterman, of Police Headquarters, played the part of the desk sergeant and Sergeant William Duffy, of the First Precinct, represented a sergeant in command of a relief squad going on patrol, both taking their parts with equal distinction. The only complaint heard from the audience at any time was that the play was too short. Mayor Fagan, the police commissioner and all prominent city officials as well as well known citizens gave the play their heartiest support.

♣

NEW SYSTEM OF REFUSE COLLECTION.—Superintendent G. H. Hanna, of the Street Cleaning Department of Cleveland. Ohio, is just breaking in a new system for the collection and disposal of all the city's refuse. This involves the gathering of ashes and house refuse, such as paper, old bottles, cast-off clothing, or in fact anything that would tend to be a nuisance if left in yards, or thrown into alleys, or streets. Mr. Hanna spent several months in investigating various systems now employed in different cities in the United States and he says in a letter to the editor: "I believe that the system employed by John McGaw Woodbury of New York City, is the most appropriate for this city and with a few minor changes I have adopted it." Continuing, Mr. Hanna says, "The city will be laid out into fifteen districts, the commercial part of the city to comprise five districts, which will be patroled every other day, or three times per week, and the residence districts once per week. We will employ sixty wagons to begin with, and in time add to the system as needs require. We will try to utilize as much of the refuse as is possible by selling it; the rest we will burn. The coal ashes from boilers (coarse ones) we will store and sell for concrete or fireproof. In fact, we will aim to turn it into as much money as is possible."

♣

WORCESTER, MASS., pays its Chief of Police a salary of $2,000 per year; deputy chief, $1,500; captains, $1,200; lieutenants, $1,150; Sergeants, $1,100; patrolmen, $2.25 per day for the first year, $2.50 the second year, and $2.75 the third year. Detectives receive $3.25 per day; the surgeon, $1,100 per year, and the matron, $700.

♣

THE BEAUTIFUL CITY.—When the second huge suspension bridge from New York to Brooklyn was built, a devastating army of workmen scarred a wide gash in the East Side of New York. Block after block of tenements disappeared, leaving an unsightly expanse of vacant lots along Delancey street. Talk was made of an elevated railroad here to take the traffic of the bridge, and it seemed but a matter of building it forthwith to shadow the streets where the East Side children play and add another roar to the city's sounds and another blotch to its appearance.

Now the East Siders do not, as a rule, form neighborhood clubs for "blocks beautiful," nor do they try very hard in any way to keep their section of the city sightly. All the more notable, then, that enough of them organized to enter vigorous protest against the covering of those vacant lots with an ugly elevated railroad. A committee of a hundred citizens was formed, which went to work at once. Their voice was soon heard. They even published a card whereupon appeared a photograph of the vacant lot. Beneath was the legend, "Delancey street as it now is. Its width is so great that it may be made the garden spot of the East Side, provided the L trains from Brooklyn go into a subway." Below was a photograph of the Bowery with elevated trains rushing up and down. Beneath it said, "The Bowery and its L stilts, or Delancey street as some people would make it look." Then came a photograph of the fine Avenue Champs Elysées in Paris. The subjoined caption was "Something like this is not too good for the East Side." This card, and the other work of the committee, indicated that the people of the East Side were in earnest in wanting their part of the city beautified. A municipal committee called the New York City Improvement Commission was at the same time preparing a plan for the treatment of this approach to the bridge, but far more suggestive of the growing desire for a more beautiful metropolis was this plea of the people who must live with it, for a plaza rather than another Bowery.

* M. G. Cunneff, in the July "World's Work."

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say about Civic Affairs—Municipal Reports Received

Books

THE growth of the political reform movement in Chicago is detailed by Mr. Hoyt King, Secretary of the Legislative Voters League, in the *Annals of Political and Social Science* for *March.*

The claim is made that the municipal reform movement that has been so widespread during the past decade, and has brought such men as Folk of St. Louis, and Jerome of New York to the front, really started in Chicago, in 1896, with the organization of the Municipal Voters' League.

This League is a non-partisan organization, and its method is to secure and publish the facts in reference to each candidate's record, leaving the voter to choose the best contestant.

But the Municipal Voters' League is but one of a trinity of organizations into which the original movement has developed, and is now supplemented, or paralleled by the Citizen's Association and the Legislative Voter's League. The three organizations work together in harmony and with a greater measure of efficiency through this specializing of the work.

Information is secured in detail regarding the record of each aspirant for elective office and tabulated for future reference.

The Citizen's Association began business in 1874, and has made its investigations each campaign since, all of which are fully recorded and of easy reference. A complete list of the civil officers is kept and the record of any public servant may be found in its records, telling just what offices he has held and how he has conducted each, together with newspaper clippings concerning his administration. No man, under this system, can get away from his record, and it behooves all to be wary of even temporary slips in the hope that time will obliterate his foot prints.

The credit for this method of keeping tab on public officers is accorded Mr. George E. Cole, and is as thorough as the record of a mercantile agency on a man's business transactions. All newspaper comments are run down and verified.

The deterrent effect on men with shady records presenting themselves for office has been marked, as such do not relish having the lime-light turned on their past.

The Legislative Voters' League deals with the State officers as the Municipal Voter's League has to do with aldermen and other city officials.

The work accomplished by these associations has been most successful, though the results have been obtained through great effort against a powerful and compact organization, and frequently accompanied with almost tragic clashes.

In 1903, there were three independents elected to the State legislature through the efforts of these Leagues. They entered on their duties as members of a body perhaps more than usually venal, but before the session closed they had brought ninety-seven of the one hundred and fifty-three members under their banner, had routed corporate effort to control the municipal railways, and in a most dramatic episode, had actually driven the Speaker of the House from his chair, for unjust rulings.

The municipal assembly has been purged in much the same manner, and to-day Chicago can boast as earnest and true a body of civic rulers as any city of the time.

The method is puisant in its very simplicity, and is suggestive to every city joining in the movement prevalent at present for municipal house-cleaning. It depends for success on the fact that the majority of people will not support a dishonest candidate, and endeavors to give the voter the opportunity to decide for himself the question of fitness.

♣

Elements of Applied Microscopy. By Charles Edward Amory Winslow. Instructor in Industrial Microscopy, etc., Massachusetts Institute of Technology. 8vo. Cloth, 183 pages. John Wiley and Sons. 1905. In this book Prof. Winslow seeks to supply a practical text book on microscopy for class room use. Technical works and popular books abound, but for elemental instruction there seems to be a demand for a treatise, perhaps too restricted for the specialist, and not sufficiently entertaining for the general public, but of importance for its purpose. This field Prof. Winslow occupies so completely that it will be a long time before any other writer will attempt competition.

♣

Modern Civic Art, or the City Made Beautiful. By Charles Mulford Robinson. New York, 1904. G. P. Putnam's Sons. Royal 8vo. Cloth, 375 pages. $3.00. This book is an illustration of the capabilities of the publishers and is a credit, mechanically, to the art of book making.

The table of contents shows a good synthetic program in the mind of the author. After the introduction, Part I. deals with the City's Focal Points, and includes chapters on the Water Approach, the Sand Approach and the Administration Center. This arrangement develops into treatment of the Business District in Part II. and the Residential District, Part III., and culminates in The City at Large.

Mr. Robinson is an authority—perhaps *the* authority—on the subject of which he writes, but he detracts from the interest his argument might possess by a style teeming with metaphor. Could he have made a free use of a blue pencil on his manuscript and reduced his language to the capacity of the ordinary reader, his ideas would have secured a wider interest. Those readers, however, who can bring themselves to the point of diving through this froth will find much that is solid underneath.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

Articles in American Periodicals

Heating and Ventilating—VII, *The American Architect,* May 27, New York.

Small Parks in Chicago, illustrated; *The Grouping of Public Buildings* (to be continued), a paper read before the fifth convention of the Architectural League of America at Pittsburg, Pa., April 17, 1905. *The Inland Architect and News Record,* May, Chicago, Ill.

Village Improvement, by Frederick Law Olmstead, *The Atlantic Monthly,* June, Boston, Mass.

Forty Years in the Wilderness; or, Masters and Rulers of the "Freemen" of Pennsylanvia.—V. Municipal Black Plague.—Chapter I. Light in the Midst of Darkness (illustrated), by Rudolph Blankenburg; *Municipal-Ownership Methods,* by Professor Frank Parsons, Ph. D.; *The Building of the City Beautiful* (concluded), by Joaquin Miller, *The Arena,* June, Trenton, N. J.

Chicago's Street Railway War, by Philip P. Frost; *How Chicago Will Do It,* by Edward F. Dunne, mayor of Chicago, *The World's Work,* June, New York.

Philadelphia's Civic Outlook, by Joseph M. Rogers, *The American Monthly Review of Reviews,* June, New York.

Municipal Ownership, The Outlook, June, New York.

Municipal Indebtedness: A Symposium, The Annals, May, Philadelphia, Pa.

Public Ownership versus Public Control, by Hayes Robbins, *The American Journal of Sociology,* May, Chicago.

Essentials of School Sanitation, in two parts, by William Paul Gerhard. *The American Architect,* June 3 (part I) and June 10 (part II), New York.

Typhoid: An Unnecessary Evil, by Samuel Hopkins Adams. *McClure's,* June, New York.

Articles in Foreign Periodicals

Filtration Plant at Kolar Gold Field, India (illustrated), by Edmund B. Weston, M. Am. Soc. S. E., M. Inst. C. E. and *Ozone Purification Plant at Ginneken, Holland* (illustrated), by Leon Gerard, Electrical Engineer, sometime Professor of Medical Physiology at Brussels University, appear in *Water,* April 15, London, England. Price, 6 pence.

Motor Cars and Roads, an exhaustive inquiry among county surveyors showing that cost of road maintenance is being increased by heavy motor and motor car traffic, *The Municipal Journal,* May 12, London, Eng. Price 2 pence.

Portland Cement, an abstract of a paper read before the Society of Architects, by Mr. H. K. G. Bamber, covering the British Standard Specifications, *The Public Health Engineer,* May 13, London, Eng. Price, 3 pence.

Experiences in Sewer and Drain Construction (2), (illustrated), a paper read before the Birmingham Clerk of Works and Building Foremen's Association, by Edward B. Savage, Assoc. M. Inst. C. E., and superintendent engineer in charge of the Sewers and Rivers Department, Birmingham, Eng. *The Surveyor and Municipal and County Engineer,* May 26, London, Eng. Price, 3 pence.

Bricks for Footpath and Carriageway Paving, a paper prepared and read by Mr. A. E. Blizzard on Municipal Engineers' Day, Surveyor Exhibition, London, Eng., appears in the *Suveyor and Municipal and County Engineer,* May 12, London, Eng. Price, 3 pence.

Concrete-Steel Water Tower (illustrated), by Leonard S. Doten, C. E., U. S. A.; *Practical Notes on Water-works Construction* (illustrated), read before the Junior Institution of Engineers, April, by George H. Hughes, M. I. Mech. E., *Water,* May 15, London, Eng. Price, 6 pence.

Road Maintenance (illustrated); *Evolution of Main Drainage,* abstract from an address to the Association of Managers of Sewage Disposal Works, by Mr. J. E. Worth, M. Inst. C. E., district engineer to the London County Council, *The Municipal Journal,* May 26, London, Eng. Price, 2 pence.

Water Purification, a paper read before the Engineers' Club of Toronto, Can., by D. J. Russell Duncan, *The Canadian Engineer,* June, Toronto and Montreal, Can.

The Bacteriological Examination of Water (with tables), prepared by John C. Thresh, M. D., etc., and W. S. Strachan, B. Sc. (London), for the committee appointed by the Home Counties Branch of the Medical Officers of Health Society, *Public Health,* June, London, Eng. Price, 18 pence.

Hull Baths (illustrated), *The Municipal Journal,* June 2, London, Eng. Price, 2 pence.

Experiences in Sewer and Drain Construction concluded, (illustrated), by Edward B. Savage, Assoc. M. Inst. C. E., superintendent engineer in charge of the Sewers and Rivers Department, Birmingham, Eng. *The Surveyor and Municipal and County Engineer,* June 2, London, Eng. Price, 3 pence.

Poland's Schools*

In the kingdom of Poland, with its 127,000 square kilometers, somewhat less thickly settled than Galicia, it is true, having only seventy-three inhabitants per square kilometer, there are less than 2,200 common schools. Fifty per cent. of the adult population of Warsaw is illiterate. With a school population of 110,000 between seven and fourteen, this city has a total primary school accommodation for not more than 40,000. The public schools, conducted in an alien language (Russian), have a capacity for only 14,000; an equal number are accommodated in the Jewish schools, which teach Yiddish and Hebrew, while private enterprise gives facilities for 10,000 or 12,000. The first common school building ever erected in Warsaw was opened in 1903. All the others are housed in second-class private lodgings. Lemberg, Galicia, with only 130,000 inhabitants, has thirty handsome school-houses.

* From David Bell Macgowan's "The Future of Poland" in the July *Century.*

GROWTH OF AN ENTERPRISING CONCERN

After preparation, covering a period of several months, the H. Mueller Mfg. Co. has formerly opened its Eastern Division in the commodious quarters at 254-258 Canal street (cor Elm), New York City, and is now extending invitations to its friends in the water, gas and plumbing trades to visit its sumptuous new business place. The accompanying engraving shows the building which it occupies to be one of the handsomest in the business district of New York.

As was announced at the close of the World's Fair, the magnificent exhibit which the company had at the exposition was moved to New York, and under the supervision of its experts it has been installed with even surpassing cleverness in its new Eastern house. The interior of the office has been furnished in an expensive manner to match the elegant antique furniture, and beveled plate glass show cases used at the exhibit, and these, with rich tapestries and tasteful minor furnishings comprise one of the handsomest and most luxurious office suites of any in similar lines of trade in the East. The office has entrances both on Canal and Elm streets, and besides conveniences of access has every facility for ventilation and light.

Oscar B. Mueller
New York Manager

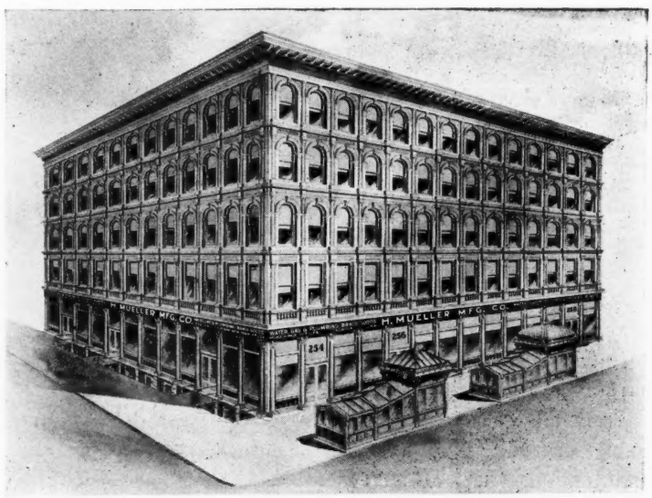
In the showroom are displayed samples of goods which are carried in stock. These comprise water main tapping machines, pressure regulators, brass water connections, lead goose necks, curb and corporation stop-cocks, service boxes, service clamps, strainers and pipe line tools for water-works use; gas main tapping machines, gas cocks, gas meter connections and gas relief valves for the use of gas plants, and hundreds of samples of ground key, compression and fuller work and tools for plumbers' use.

At the rear of the office on the ground floor and occupying the whole of the basement, are the large stock and shipping rooms. The former are fitted with storage bins eight feet high by four feet wide, and divided through the center with heavy wire screening. The shipping room, on the ground floor, has an entrance on the Elm street side for the convenience of city deliveries. Both the shipping and stock rooms are connected with the office by private telephone, are arranged so as to give the employees an airy workroom, and have every modern facility for saving labor and assisting in the executing of orders on time.

The personnel of the new branch house includes one of the members of the firm and one of its ablest and best known traveling men. Mr. Oscar Mueller, the treasurer, and the youngest of the six sons comprising the firm, is the resident manaager. Although a young man in point of years, Mr. Mueller has had a business training that has fully equipped him for his important post. After finishing a course in mechanical engineering at the University of Illinois, he entered the drafting department of the works of the company at Decatur, Illinois. From this position he was promoted to other and more important places, in the shop and offices, being, in 1903, the factory business manager. In that year the company began making preparations for their exhibit at the World's Fair, and, on account of the wide grasp of business which his varied responsibilities had given him, he was selected to represent the firm at the Exposition. As was expected of him in this exacting and responsible position, he proved courteous, affable, careful and resourceful, and his managerial abilities have been fittingly recognized in his selection to shape the destinies of his company's first branch house. His friends, and they are many, expect him to do in his new place as he has done in all of his old ones—to keep on growing until bigger and better things are provided for him.

Mr. Tom F. Leary, for years the representative of the company in the Central West, is the assistant manager. Mr. Leary was selected for his position on account of his exceptional ability as a salesman, and his disposition to always make his talents count. He has many friends on the road and in the water, gas and plumbing trades who will be pleased to learn that his firm have provided handsomely for him.

The territory covered by the new division comprise that east of the western line of Pennsylvania and north of the southern line of Virginia. Included in it are the following salesmen, with headquarters: Charles Tillinghast, New York City; W. D. Malane, 20 Lincoln place, Brooklyn; A. C. Pilcher, Heublin's Hotel, Hartford,



THE NEW EASTERN OFFICE OF THE H. MUELLER MFG. CO.

Conn.; W. F. McCarthy, Green's Hotel, Philadelphia, Penn.; C. T. Ford, 1408 Pennsylvania avenue, Washington, D. C.; W. L. Dickel, Young's Hotel, Boston, Mass.; W. R. Hughes, 5711 Ripey street, Pittsburg, Pa.; George A. Caldwell, Arlington Hotel, Buffalo, N. Y., and Howard A. Garrard, New Falmouth Hotel, Portland, Me.

"As Good As Bitulithic"

For several months past "The Municipal Journal" has been printing authentic information received through its representatives and from the Warren Brothers Company, relating to the laying of pavement, said to be "as good as bitulithic." In every instance it has been shown that the so-called "as good as bitulithic" pavement has gone to pieces after a few months' service.

The following letter was addressed to Mr. H. H. Jones, of Walla Walla, Washington, by Mr. Newton Mitchell, superintendent of the Paris Water Company of Paris, Kentuckey, under date of April 10th, 1905. Mr. Mitchell describes the experience of that city with "as good as bitulithic," as follows:

"Yours received in regard to pavement. Last year our city advertised for the paving of ten city squares. A party from Indianapolis, Indiana, underbid the Warren Brothers a small sum and secured the contract, laid the streets, and made a complete failure, so much so that the city refused to accept them. After going through the winter they are full of holes from ten inches to three feet in diameter and from six to eight inches deep. The contractor has agreed to recoat the surface with four inches. If you want a good street I would advise employing the Warren Brothers, and I believe you will not regret it. If I can be of any other service to you call on me."

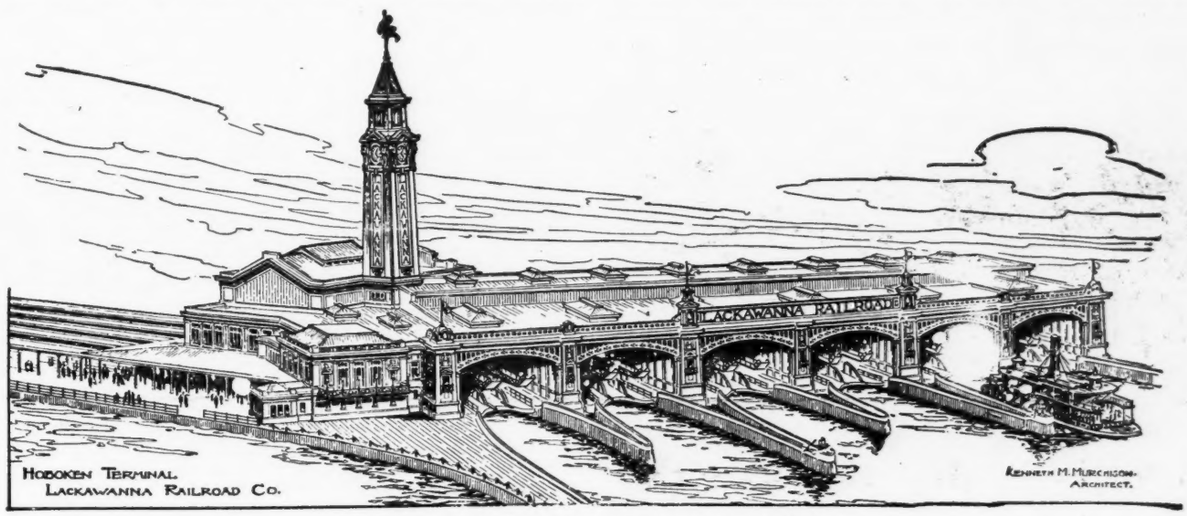
New Lackawana Terminal at Hoboken

WORK has already begun on the new terminal which the Lackawana Railroad Company is erecting in Hoboken, N. J., and it is expected that the building will be completed and in operation within two years. The improvement comprises a vast ferry and railroad structure, there being six slips to accommodate the boats plying to Barclay, Christopher, and Twenty-third streets in New York City, while sixteen tracks will make a rapid train movement possible.

The building will be absolutely fireproof, a minimum of wood being used. Its construction will be of steel and concrete throughout, the walls on the exterior being covered with copper-finished verdigris.

The station will be attractive from an architectural point of view, and numerous new features are planned for the convenience of the road's patrons. The main waiting room will be one hundred feet square and fifty-four feet high, with enormous windows on all sides. From this will open the women's rooms, smoking rooms, lunch room, parcel and information rooms and numerous other dependencies. The restaurant will be on the second floor overlooking the water, with a view up and down the river, and will be of sufficient size to accommodate two hundred people. A wide balcony projects from the restaurant, for dining out of doors in summer.

A wide concourse will give access to the second deck of the boats and this concourse alone will hold thirty thousand people.



PROPOSED NEW LACKAWANA TERMINAL AT HOBOKEN

Passengers from boats to trains will not be compelled to pass through the main waiting room, but may proceed through a forty-foot concourse to a broad flight of steps leading to the tracks.

Owing to the fact that it is physically impossible to raise the level of the tracks to the height of the second floor, the tracks will remain on the grade level and passengers will have the option of ascending to the second deck of the boats by an inclined plane of gentle slope or by using elevators and stairways.

On the ground floor of the ferry-house will be found a large waiting room for the Hoboken ferry passengers and on the second floor numerous division offices of the company, a completely equipped emergency hospital, toilets, barber-shop and baths.

The exterior of the building will be six hundred feet long on the river side, the tower rising to a height of two hundred and twenty-five feet. This will be electrically illuminated at night and its lighted clock faces will be one of the noticeable sights of the harbor.

A separate building for the use of immigrants and Pullman supplies, just to the south of the terminal building, is nearly completed and will be occupied within a few months. The work of building is necessarily somewhat slow, as the structure must be erected in sections so as not to interfere with the heavy traffic the Lackawana is now carrying. The company hopes to have everything completed within twenty-six months after the commencement of the work. Kenneth M. Murchison is the architect.

The Work of the Trench Machines*

A REPRESENTATIVE of THE MUNICIPAL JOURNAL, on a recent trip throughout the Central States, was surprised to note the number of cities using machinery for excavating trenches for water pipes, sewers and electrical conduits.

The machine used is made by The Municipal Engineering & Contracting Company of Chicago, and consists of a traction engine having attached to the rear end a long excavating beam equipped with a traveling chain, having attached to it at regular intervals, buckets containing plow and cutter points.

The chain travels around the excavating beam and the plow points loosen the soil which is caught by the buckets and carried up an inclined apron and thrown onto a conveyor belt. This conveyor belt travels at right angles to the chain and throws the dirt on one side of the trench. The mechanism is so arranged that the dirt can be thrown on either side of the trench at the will of the operator. When thrown to one side it is afterwards scraped into the trench by any of the methods in general use among contractors.

Occasionally a contractor uses in connection with the machine a back-filling conveyor. The back-filling conveyor is attached to the excavating machine, and has a separate engine receiving steam from the boiler through a steam hose. The back-filling conveyor is sometimes sixty to seventy feet long, and the dirt is thrown upon it from the cross conveyor and carried to the end and dropped back into the trench. When the block of sewer is ready the trench is flushed with water and a roller passed over the loose earth, pressing it into the filled trench.

The speed with which these machines work is wonderful. The Municipal Engineering & Contracting Company does not sell them, but they are leased to contractors and a half a hundred of them are in use this season. They have been on the market a number of years and have proven to be the only practical machine for the purpose for which they were devised, and are gaining in popularity.

The company is advertising extensively this year, and in this issue of THE MUNICIPAL JOURNAL they are carrying a large advertisement. With machines like this time limits would seem to have no terrors for contractors.

Each machine does the work of from eighty to one hundred and fifty men, and the advantages for contractors doing work in small towns where labor is scarce can be readily seen. By means of these machines as many as 900 feet of sewer have been laid and covered in one day.

* In our June issue several errors occurred in the short article about the trench machines made by the Municipal Engineering and Contracting Company, which was due to facts contained in an old circular, given to the editor by mistake. For example, we stated that under favorable conditions the machine will easily excavate 300 cubic yards per day, whereas, it has many records of having excavated over 650 cubic yards in ten hours. The machine will dig trenches varying in width from fourteen inches to sixty inches, instead of twenty-seven to sixty as stated in June.

The manufacturers speak always of cubic yards, and when it is stated that a great many records have been made for one machine of over 650 yards in ten hours, a person who is used to figuring on trench work can see what that means.

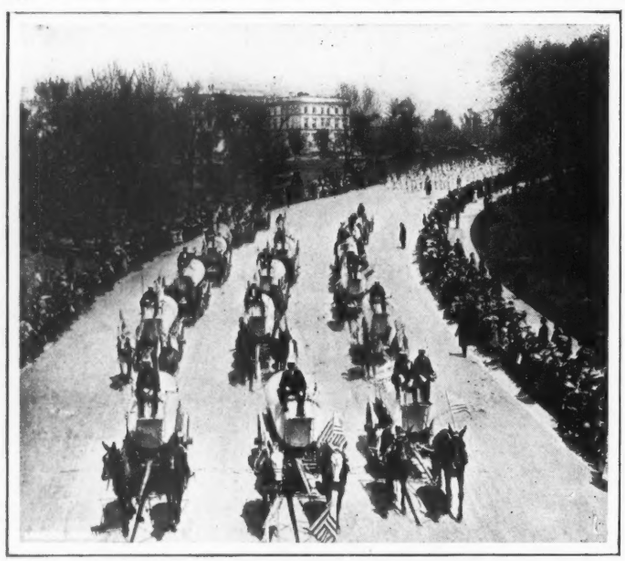
The machines work best in clay where it is necessary to pick, but they work well in nearly all soil. In cities where water pipes and gas pipes run across the streets to houses, many expedients are adopted whereby the work is done without damage to the house connections and without annoyance to the householders. In all cities and towns where these machines have been employed the owners prefer them because there are so few workmen on the street and the work is done so quickly. Under ordinary conditions a block may be open for a week at a time, but when the machine is used the block is generally open only for a day or two.

The advantages of using a trench machine instead of hand labor are all set forth in the advertisement referred to. The machines are made in several sizes, excavating trenches in depth to twenty feet, and in widths varying from fourteen to sixty inches.

Each machine carries a supply of buckets of different widths so that the one machine can cut two or three different widths of trenches by simply changing the buckets on the chains.

Sanitary Street Flushing Machine

The Sanitary Street Cleansing & Sprinkling Machine Co., which is the sole owner of the Murphy Patents for the United States, speaks with the utmost confidence of the efficiency of its street flushing machine. The concern does not ask you to take its word, but



SANITARY STREET FLUSHING MACHINE IN CIVIC PARADE DURING DEDICATION EXERCISES AT WORLD'S FAIR, ST. LOUIS

would rather you would test the actual working of the machine. It refers with pride to the work of the machine as used in the street departments of Cleveland, Kansas City, Louisville, New Orleans, East St. Louis, Ogden, Utah, St. Louis and other places.

No stronger recommendation can be given than contained in a letter dated May 12, 1905, addressed to J. O'Hagen, Esq., Superintendent of Streets, Erie, Pa. It reads as follows:

"Your favor of the 11th instant to hand. You inquire as to whether we use automatic flushing machines on our streets, and as to their efficiency. Let me state that I believe no other device could be invented that would give as much universal satisfaction as the method employed in Cleveland. We have twenty-seven h.-p. street sweepers which we are disposing of and replacing them with flushers, of which we now have seventeen, which are employed in two shifts of eight hours each.

"As to its economic and satisfactory features, let me say from a standpoint of cleanliness and sanitation it has no equal. It reduces the dust problem to a minimum.

"As to cost, it is just one-third less than the sweeping process. We are using the Sanitary Street Cleansing & Sprinking Machine Company's wagon, and find it the simplest and most economic of any made. Address inclosed.

"If at any time I can be of service to you, let me know, and I will be at your command."

This letter is signed by Mr. G. H. Hanna, superintendent of Street Cleaning Department, Cleveland, O.

Another letter from Mayor Silas Cook, of East St. Louis, Ill., reads as follows:

"I am pleased to state that we are now and have been using exclusively, for the past two years, the flushing machines manufactured by the Sanitary Street Cleansing & Sprinkling Machine Company of St. Louis, Mo., to clean the paved streets of East St. Louis, most of which are brick.

"The machines have given perfect satisfaction from every standpoint and I cheerfully recommend the adoption of the flushing system and these particular machines, to any municipality desiring its streets thoroughly, economically and sanitarily cleaned."

Full particulars as to the price of these machines can be had on application to the Sanitary Street Cleansing & Sprinkling Machine Co., Chemical Building, St. Louis, Mo.

An Interesting and Instructive Folder

"Map of the Underground Railway of New York" is the subject of No. 39 of the New York Central's "Four-Track Series" just published. This number gives quite a good deal of information in regard to the Underground Railway, and enables one to see exactly where it runs and how long it takes for both local and express trains to make the journey.

On one side of the folder is a map of the Underground Railway, and on the other side is a fine map of New York City showing the entire city from the Battery to 141st street, and giving a list alphabetically arranged of 77 hotels, 78 clubs and 49 theaters.

In issuing this latest number of the "Four-Track Series" the New York Central has followed its old plan of educational advertising, which it is believed adds materially to its value.

A copy of the "Map of the Underground Railway of New York" will be sent to any address on receipt of a two-cent stamp by George H. Daniels, General Passenger Agent, Grand Central Station, New York.

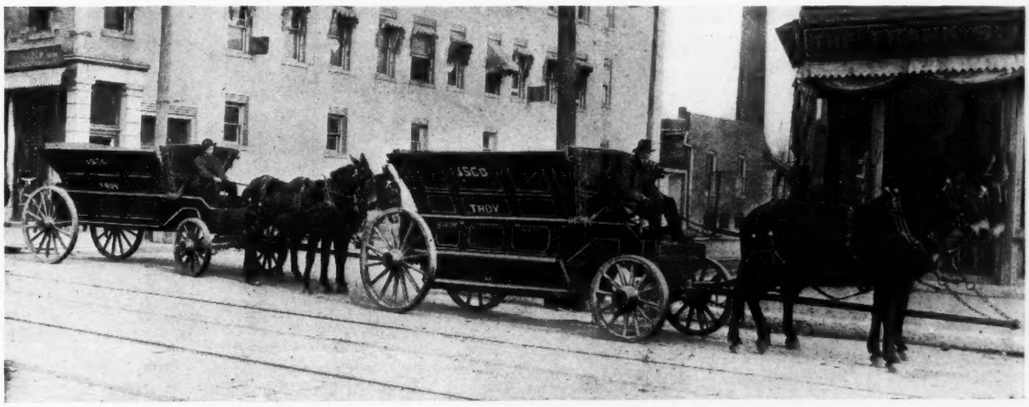
Items of Interest About the Trade

—The United States Government has just awarded to the Central Foundry Company, 116 Nassau street, New York, the contract for 2,396 feet of 8-inch "Universal pipe," 852 feet 10-inch "Universal Pipe," 384 feet 12-inch "Universal Pipe," to be installed in the new office building of the House of Representatives to be erected in Washington, D. C. Although the specifications called for the use of bell and spigot water pipe, the "Universal Pipe" was substituted in the above sizes, on account of its superior qualities and the non-leakable joint.

—The United States Consul at Prague, of the Kingdom of Bohemia, desires the latest catalogue of all exporters and importers, together with the following commercial information: "Name of firm; street, city and cable address; codes used; export discounts and terms; languages of correspondents; references or commercial rating; nature of exports and imports; list of foreign branches and agents; supplementing this with complete information permitting immediate sales." The Consul at Prague says that this information will be filed gratis in the Commercial Intelligence Department of the Consulate. The Kingdom of Bohemia has a population of over six millions, in the heart of Europe, and is practically virgin territory for American exporters.

—The Water-Works Equipment Company, 180 Broadway, New York, is having constructed the largest tapping machine ever made; it is to be operated with a six and one-half horse power gasoline engine, which sets on frame of the machine, the same being geared direct to the shaft. This machine will be able to make a 30-inch, 36-inch and 48-inch connection on any size of main from 30-inch to 48-inch, inclusive.

—The Ingersoll-Sergeant Drill Company and the Rand Drill Company have been united into a new company, called The Ingersoll-Rand Company. The new corporation was formed under the laws of New Jersey, with a capital of $10,000,000, of which $5,000,000 is preferred stock and the balance common. The factories of the two companies are located at Phillipsburg, N. J.; Easton, Pa.; Tarrytown, N. Y.; Ossining, N. Y.; Painted Post, N. Y.; Thirty-fourth street, New York City, and Sherbrooke, Quebec, and will be operated as formerly by the new company. The officers of the new company are as follows: W. L. Saunderson, president; George Doubleday, first vice-president; Jasper R. Rand, second vice-president; John A. McCall, president of the New York Life Insurance Company, third vice-president; J. P. Grace, vice-president of W. R. Grace & Company, fourth vice-president; George R. Elder, general manager of the manufacturing department; W. R. Grace, treasurer; F. A. Brainerd, secretary. For the present the main offices of the new company will be located at 26 Cortlandt street, New York.



THE TROY DUMP WAGON

—The American La-France Fire Engine Company, according to the schedule of orders for new work and repairs, must be rushed with business. The schedule includes orders from cities in various parts of the country, from the Atlantic to the Pacific, and the Great Lakes to the Gulf. It would take nearly a parge of THE MUNICIPAL JOURNAL to make a record of this work. From this the reader will be able to judge what an enormous business this concern is handling.

—The Avram-Leet Engineering Company, incorporated some time ago, succeeding the Composite Stone & Brick Company of this city, has taken offices at 150 Nassau street. This company is the owner of the Leet process and special machinery for manufacturing stone brick. A plant has already been established at Rochester, N. Y., and will soon be in operation. From tests made at Columbia University and other technical institutions, the owners of the Leet patents claim extraordinary strength and fire and weather resisting qualities for their product.

Street Cleaning Equipment

MUNICIPAL boards and committees having charge of street work have long had vexations and difficulties connected with the equipment they could get for use of their departments. When it was mud, dust, ashes, etc., to be carted away during the summer season, the ordinary wagon fitted with a gravel-box was found wanting, because it would not always hold a sufficient amount, was apt to allow a great deal of the material to lose out and again litter the streets and almost always required an extra man to assist in the work of getting the load off the wagon. Then came bottom-dump wagons, which helped along very greatly in many respects. They could be made to hold larger quantities, could be unloaded by the driver unassisted and without loss of time at the dump. But these, or at least many of them, soon became worn sufficiently to allow the smaller portions of load to leak through between the pieces forming the bottoms and litter the streets as much or more than the old style of wagon, and a number of cities have said that wagons used on their streets must be constructed so as to prevent this spreading of gravel, sand, cinders, ashes, etc.

Indianapolis, Ind., is one of the several cities doing its own street cleaning, and only recently increased its equipment for this work. Of course just that which was considered best for its requirements was sought for. For carrying work twenty-five five-cubic-yards capacity bottom-dump wagons were purchased, all of one make, which was selected after having tested quite a number of different wagons. Illustrations of the wagons in use on its streets are shown in this number.

A hinged top side can be lowered on either side of the wagon, so that material to be loaded need be raised not over five feet, and by removing a very few bolts these hinged top sides and upper portions of ends can be taken off, leaving a wagon of smaller capacity. Other features are with reference to the bottom of the box and the device for dumping the load and again closing the bottom to place. The wagon will drop an entire load of material in one place, and it is not necessary for the driver to leave the seat or stop the team. The bottom is made of two sheets of reinforced steel, one overlapping the other at center so that it prevents any leakage of load, even though it be sand, and held in place by chains at either end which wind over large spirals.

A very simple device, which is said to be not easily disarranged or gotten out of order, controls these spirals and chains, and is operated by a lever near the seat. When released the bottom doors part and drop from the center, and, as they are hinged to the sides, the material is dropped immediately underneath the wagon. The spirals on which the chains wind also permit the bottom to be closed very easily and rapidly, which is done with the same lever that releases the load, operated in an opposite directoin. If one should undertake to shovel a load from this wagon, there would be no hinderance in the way of chains, braces or other obstructions on inside of box, and because of this and the sides of body being straight, the load is sure to move when dumping mechanism is released.

These wagons are claimed to be the simplest and most serviceable bottom-dump wagons, and as they were made by the well known manufacturers of high-grade dump, log and farm wagons, The Troy Wagon Works Co., Troy, Ohio, who guarantee each and every dump wagon they sell against either defective material or workmanship, they must be good, else they would not carry such a warranty or win such general favor.

—"Advertising for Profit," the fifth edition, has been recently issued by The Manufacturers' Advertising Bureau, 126 Liberty street. The brochure is printed in two colors and gotten up in good taste.

Publications Received

—"The Ellis System of Sewage Removal" is the title of a 36-page booklet with cover, issued by The Ellis Company, 216 West 23rd street, New York, descriptive of the Ellis automatic injector system for the removal of sewage and other liquid waste from below the sewer level. The booklet also contains a partial list of installations of The Ellis System and appliances. This system is covered by patents in the United States, Canada, Great Britain, France, Germany and Russia.

—Studebaker vehicles are known the world over, and yet the company is spending an increasing amount for publicity each succeeding year. The folder recently issued describing the Studebaker exhibit at the Lewis & Clark Exposition, at Portland, Ore., which opened June 1st and will close October 15th, is not only beautiful from a typographical standpoint, but also contains a large amount of useful information to any who intend to visit the Exposition. A copy of this folder may be had by addressing the Studebaker Mfg. Company, South Bend, Ind.

—"The Winget" is the title of a 48-page illustrated descriptive catalogue issued by The Winget Concrete Machine Company, of Columbus, Ohio. It tells all about the machine, including a description of its work in various parts of the country.

—The U. S. Wood Preserving Co., 29 Broadway, New York, has just issued a handsome catalogue, printed in colors, and profusely illustrated. Both the subject matter and typography are of the best, and it tells an excellent story about the use of wood paving in a most convincing way. City engineers, street superintendents and others interested in the paving question will be glad to have a copy on file.

—The American Steel & Wire Co., The Rookery, Chicago, has just issued Volume 1, No. 1, of the "American Fence Bulletin." It is quarto in size and has sixteen pages of matter and illustrations pertinent to the subject of fencing and fencing materials. Those interested can secure a sample copy for the asking.

—Superintendent of Streets Paul Hannagan, of Lawrence, Mass., has just issued a catalogue descriptive of Hannagan's Sanitary Catch Basin and Accessories. These are patented articles, the letters patent being dated May 16th, 1905, and are manufactured by the Hannagan Catch Basin Company, of Lawrence, Mass.

—In a small catalogue and price list, Mr. Joseph G. Pollard, 141 Raymond street, Brooklyn, N. Y., describes and gives the prices of lead furnaces and pipe line supplies of all kinds, in a 12-page catalogue with cover.

—The Republic Rubber Company, of Youngstown, Ohio, with branches in New York, Chicago, St. Louis and Cincinnati, has just issued an attractive brochure in red cover embossed, giving "Some Data on Republic Side Wire Tires." Its reasons favoring the use of the Republic side wire tire seem to be sound and well taken.

—"The Cutler Mailing System" is the title of a beautiful brochure, copiously illustrated and descriptive of this well-known system. It is published by the Cutler Mailing System, Rochester, N. Y. It gives the latest developments in the use of the Cutler mailing system for the collection of mail in office and other buildings. The City Hall in Philadelphia has long been equipped with this system of collecting mails and every large city hall in the country should be so equipped.

—Special Catalogue No. 20 tells all about Jackson's high lift and high efficiency centrifugal pump, manufactured by The Byron Jackson Machine Works, of San Francisco, Cal. It is beautifully printed and illustrated. Considerable space is devoted to a listing of cities and towns which are furnished with high head centrifugal pumping plants for municipal waterworks.

Portable Stone Crushing Plants

It is more economical for a municipality, whether it be large or small, to construct and maintain its own macadam pavements than to let the work to contractors. For this reason every municipality should own a plant for such work. Julian Scholl & Co., of 126 Liberty street, New York, have a portable plant which is well adapted to use in any municipality where any other than a stationary plant is required. This outfit is known as the "Reliance Portable Plant." The outfit consists of the "reliance steel truck," the "reliance folding elevator," the "reliance portable bin," the "reliance crusher" and the "Universal steam road roller," all of which, as shown in the accompanying illustration, can be connected and easily transported from place to place by means of the road roller. The use of the road roller in this connection obviates the necessity of purchasing a separate portable boiler and engine for drawing the plant. The company, however, can furnish if desired, the standard type of portable engine and boiler in all sizes, for this service.

THE JULIAN SCHOLL & CO. PORTABLE STONE CRUSHING PLANT

The frame of the elevator is made in two sections, the upper portion being pivoted at the extremity of the supporting steel truss while the lower section is fitted to slide upon the steel angles which for a portion of the truss. The elevator can be shifted from the "operating" to the "folded" position, or vice versa, by a few turns of the crank without a stop, being under the complete control of the operator in all intermediate positions and requiring no balances or propping when passing the centre. This elevator can be furnished in lengths up to twenty-foot centers

The portable bin is mounted on steel wheels and axles, it being designed to carry the combined weight of the bin and stone when the bin is loaded to its full capacity. The rotary screen is supported at each end of the bin upon a framework arranged to be raised and lowered by means of a hoist at the front of the bin. When it is desired to move to a new location the screen is lowered by a few turns of the crank to the bottom of the bin, thus bringing the whole within the compass of ordinary loads for moving along the highway. This bin is manufactured in sizes from fifteen tons to forty tons capacity. The screen is constructed of perforated steel plates securely belted to spiders or arms. The perforations generally used for macadam are one-half inch, one and one-quarter inches and two and one-half inches, which are considered the standard for this class of work. Complete information and large illustrated catalogue can be secured on application to the company.